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FOR EVERY PURPOSE

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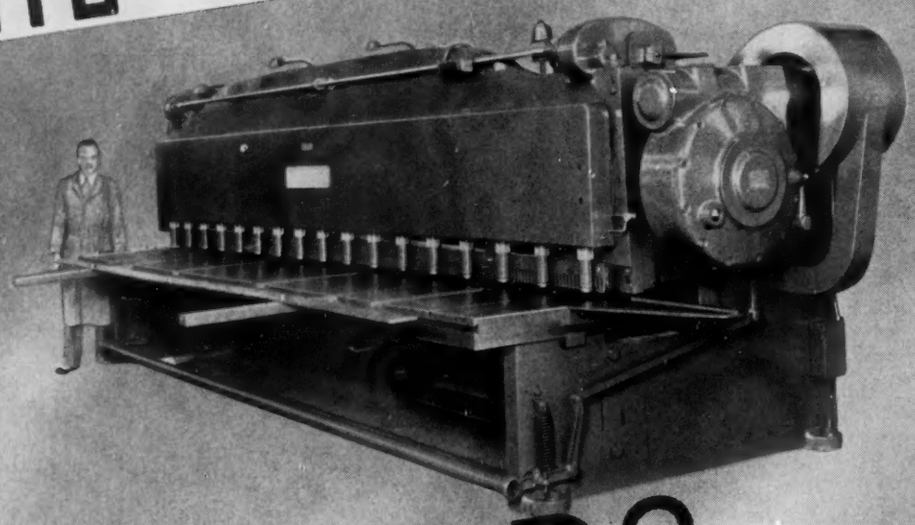
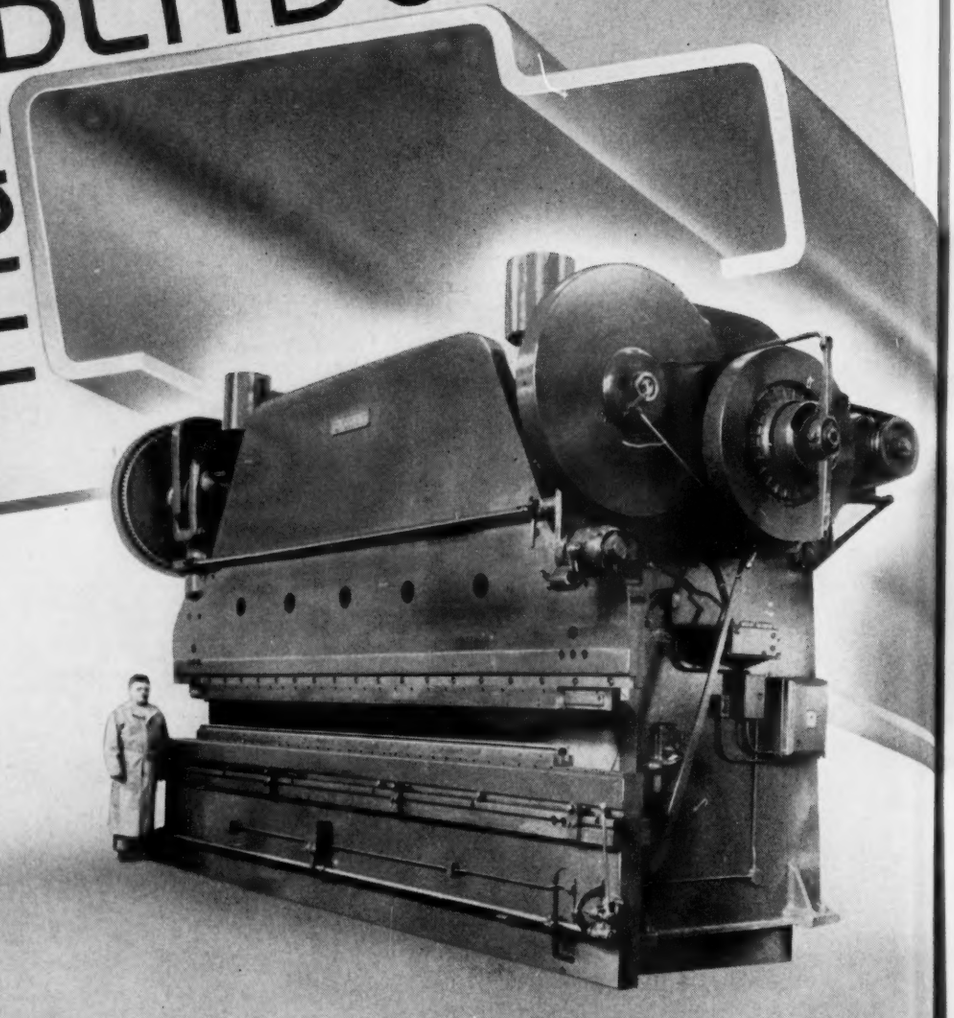


TRUE BENDS



CINCINNATI ALL-STEEL SHEARS and CINCINNATI ALL-STEEL BRAKES perform with machine tool-like accuracy. • • • •

● Write for Catalogs on these machines.

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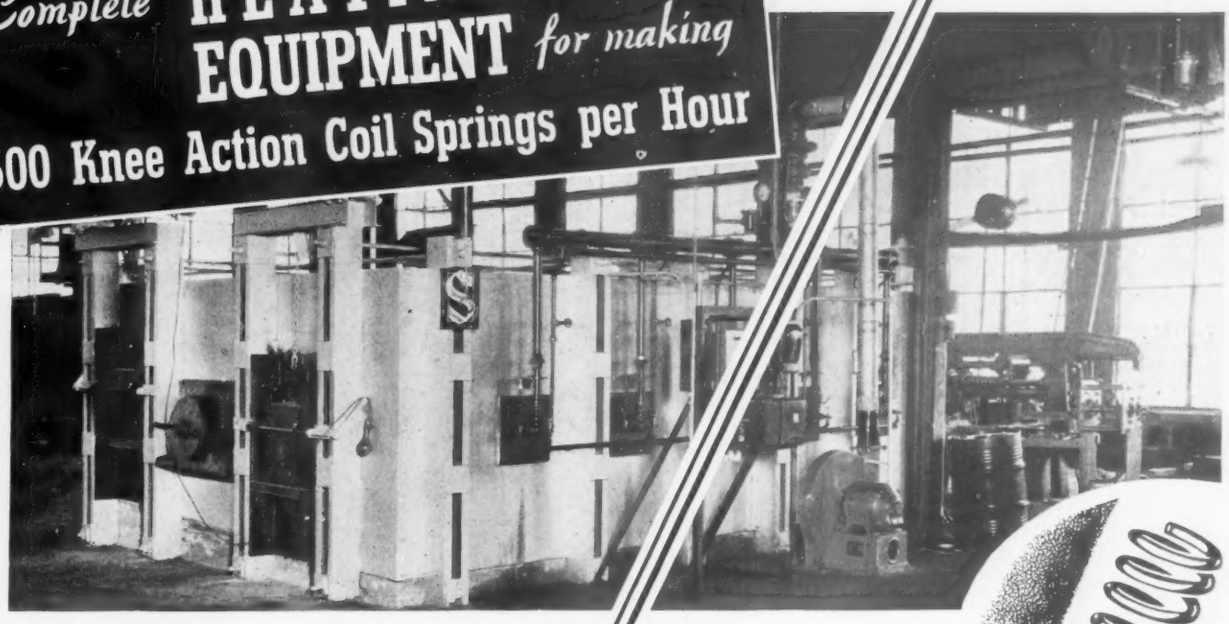
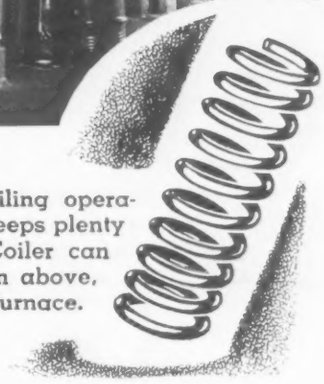
Complete HEATING EQUIPMENT *for making* 300 Knee Action Coil Springs per Hour

Many of the rods for Knee Action Coil Springs are 16 feet long by ⅝" diameter.

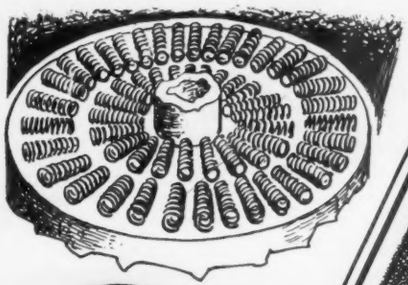


1 First operation is heating in the "Salem" Rod Heating Furnace (oil fired). From the charging door rods roll by gravity down the inclined hearth to discharge door. Capacity of furnace 300 rods per hour.

2 Second is the coiling operation. The furnace keeps plenty of rods supplied. Coiler can be seen in illustration above, to the right at rear of furnace.

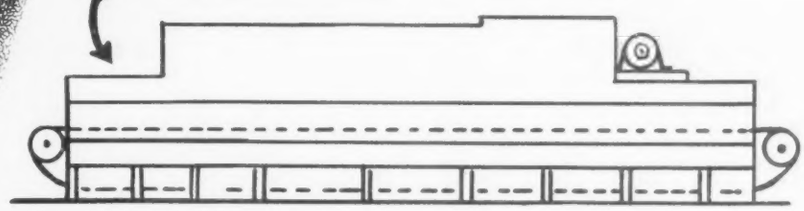


3 Third, the hardening operation in a "Salem" oil fired Rotary Hearth Hardening Furnace. Furnace employs the advantages of the rotary hearth principle and is designed so there is no flame impingement. Coils are loaded as shown below, for forced production two deep and two high on special carriers.



4 Fourth, the quench where jigs and manual operation are required to prevent warpage and distortion.

5 Fifth, the "Salem" Draw Furnace, oil fired, convection heated, continuous mesh belt conveyor. This draw furnace is of special design.



YOUR heating problems in ferrous or non-ferrous metals production will find their answer in a "Salem" solution. A qualified representative will be glad to talk with you—no obligation.

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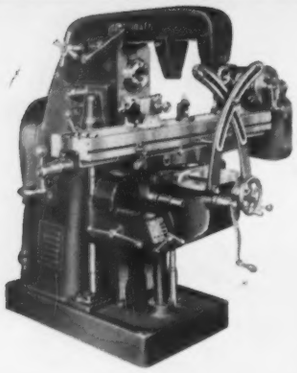
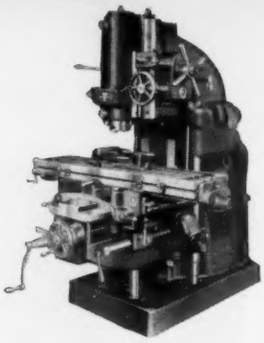
SALEM ENGINEERING COMPANY

Vol. 104, No. 1, January 2, 1939, issue of STEEL, published every Monday at Cleveland, O. Entered as second-class matter at the post-office, Cleveland, O., under act of March 3, 1879. U. S. and Canada: 1 year, $4; 2 years, $6; foreign countries, 1 year, $10; Current issues, 25c; Yearbook of Industry issue, $1 per copy.

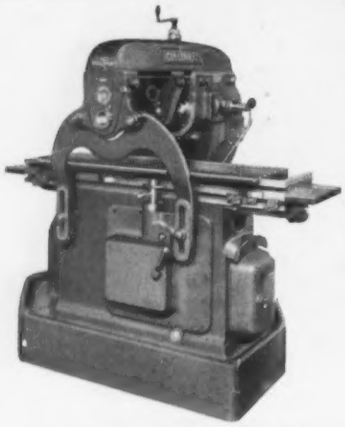


CINCINNATI No. 2 MH
Universal Milling Machine

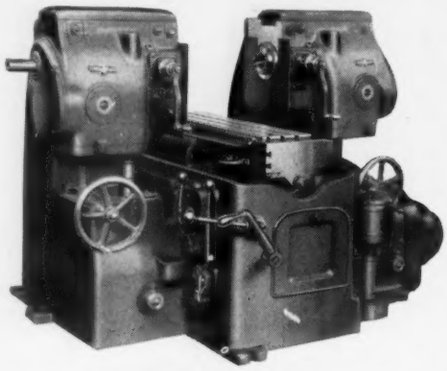
CINCINNATI No. 3 Plain
High-Speed Dial Type
Milling Machine



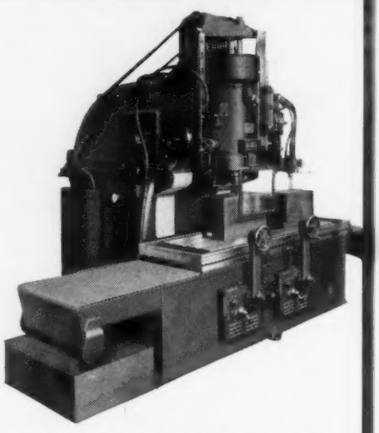
CINCINNATI No. 2 Vertical
High-Speed Dial Type
Milling Machine



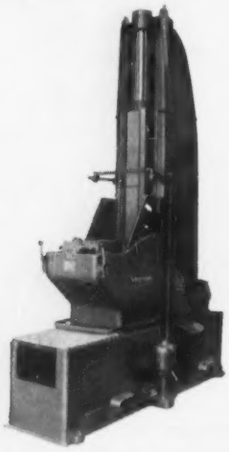
CINCINNATI 2-18 Plain
Automatic Milling Machine



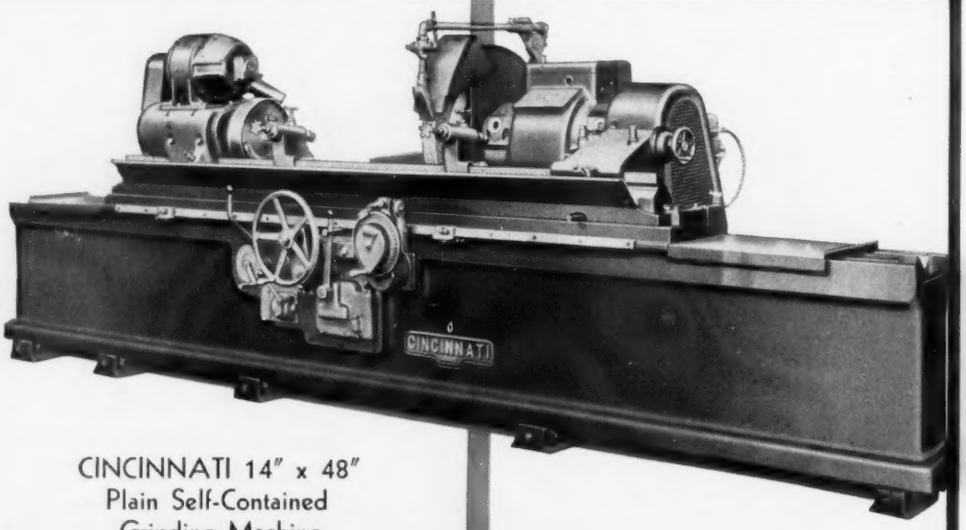
CINCINNATI 3-36 Duplex
Hydromatic Milling
Machine



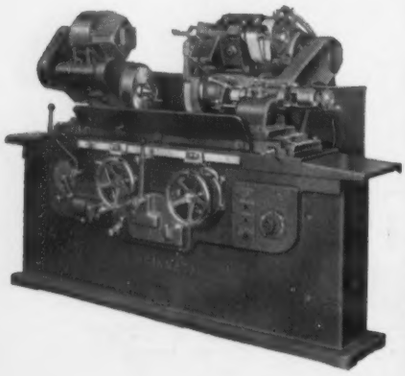
CINCINNATI 48" Hydro Tel
Vertical Milling Machine



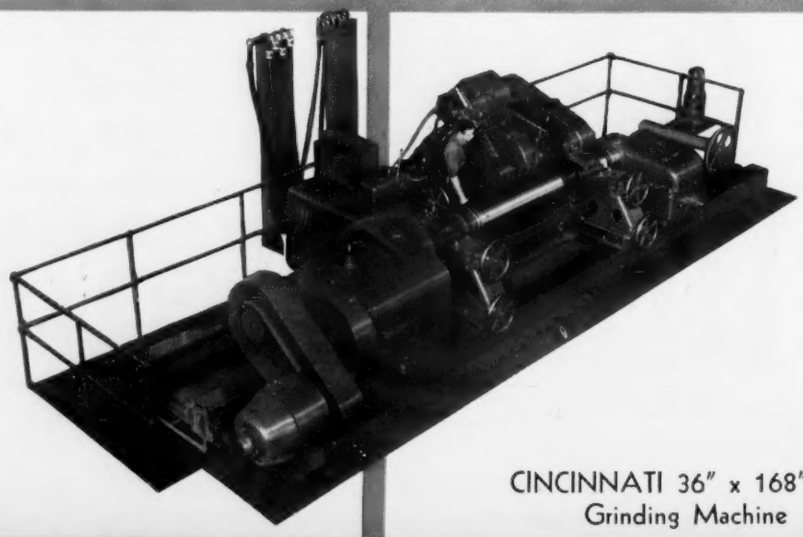
CINCINNATI 5-54 Single Ram
Vertical Broach



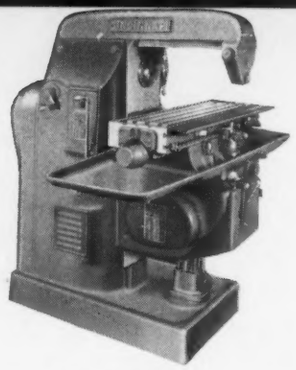
CINCINNATI 14" x 48"
Plain Self-Contained
Grinding Machine



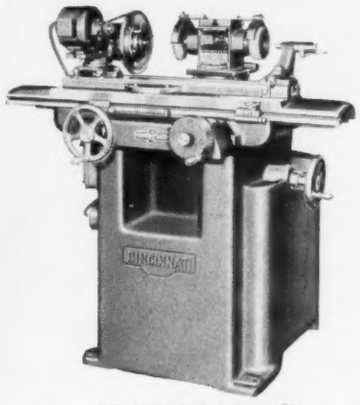
CINCINNATI 12" x 48"
Universal Grinding Machine



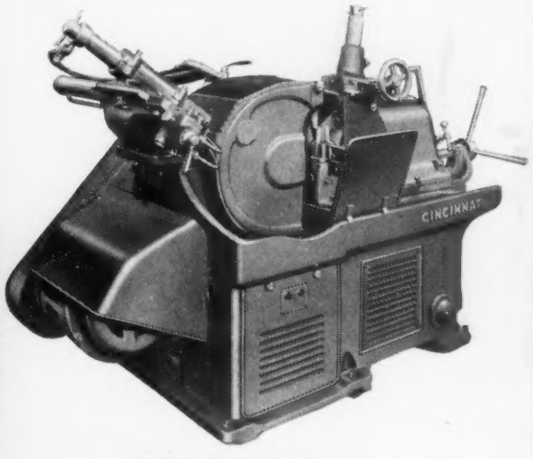
CINCINNATI 36" x 168" Ro
Grinding Machine



CINCINNATI 1-12
Plain Automatic Milling
Machine



CINCINNATI No. 2 Cutter
and Tool Sharpening
Machine



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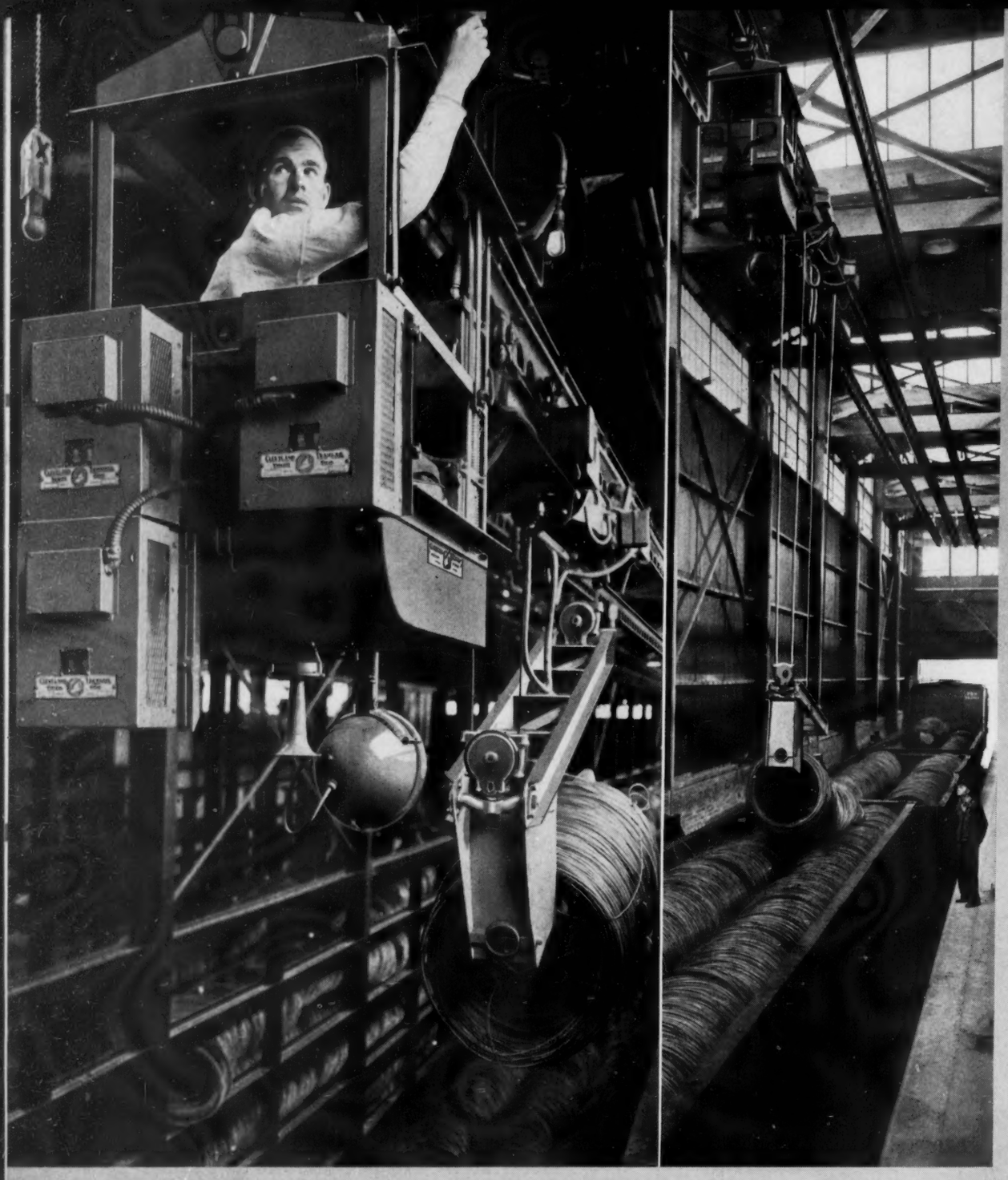

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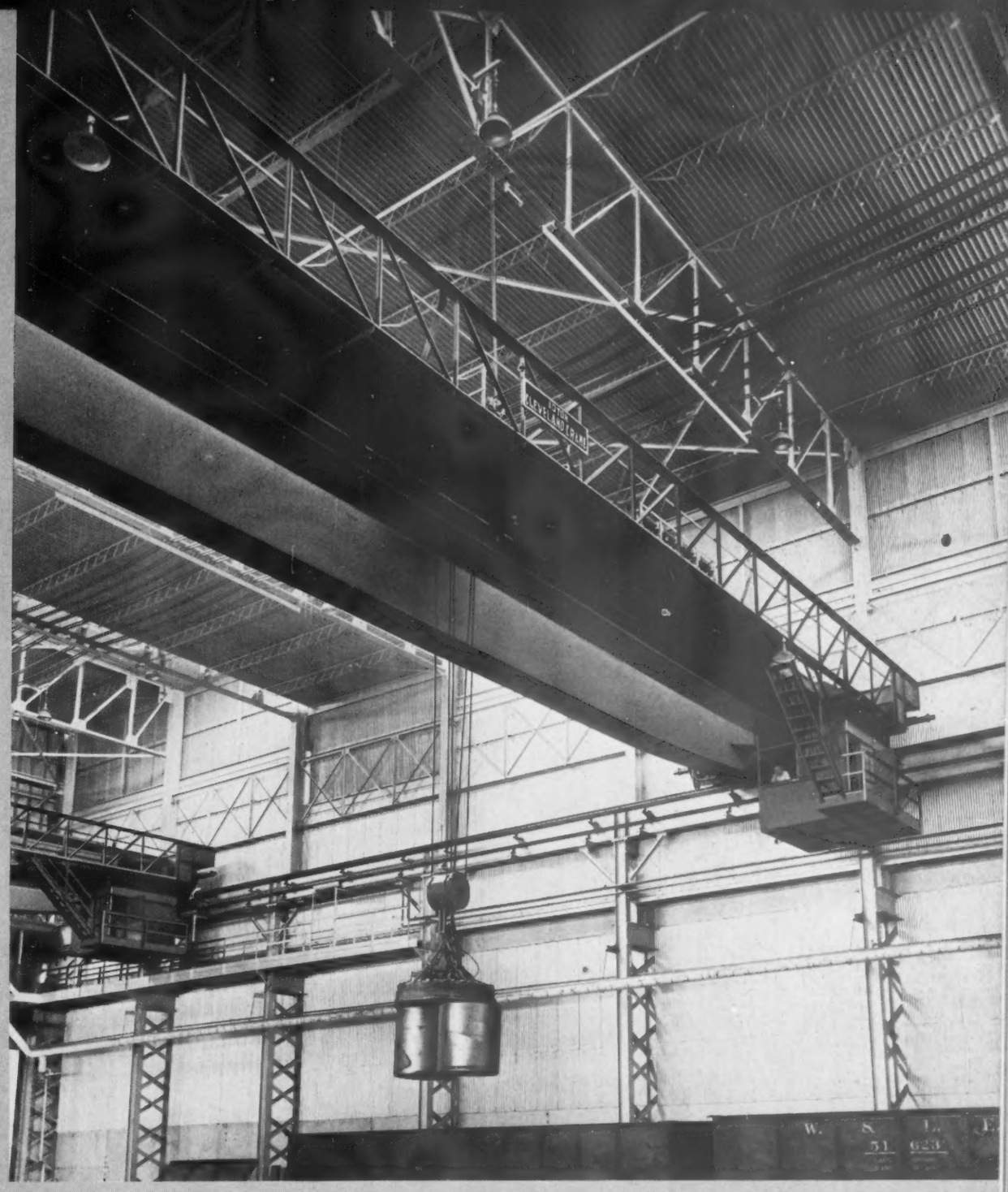

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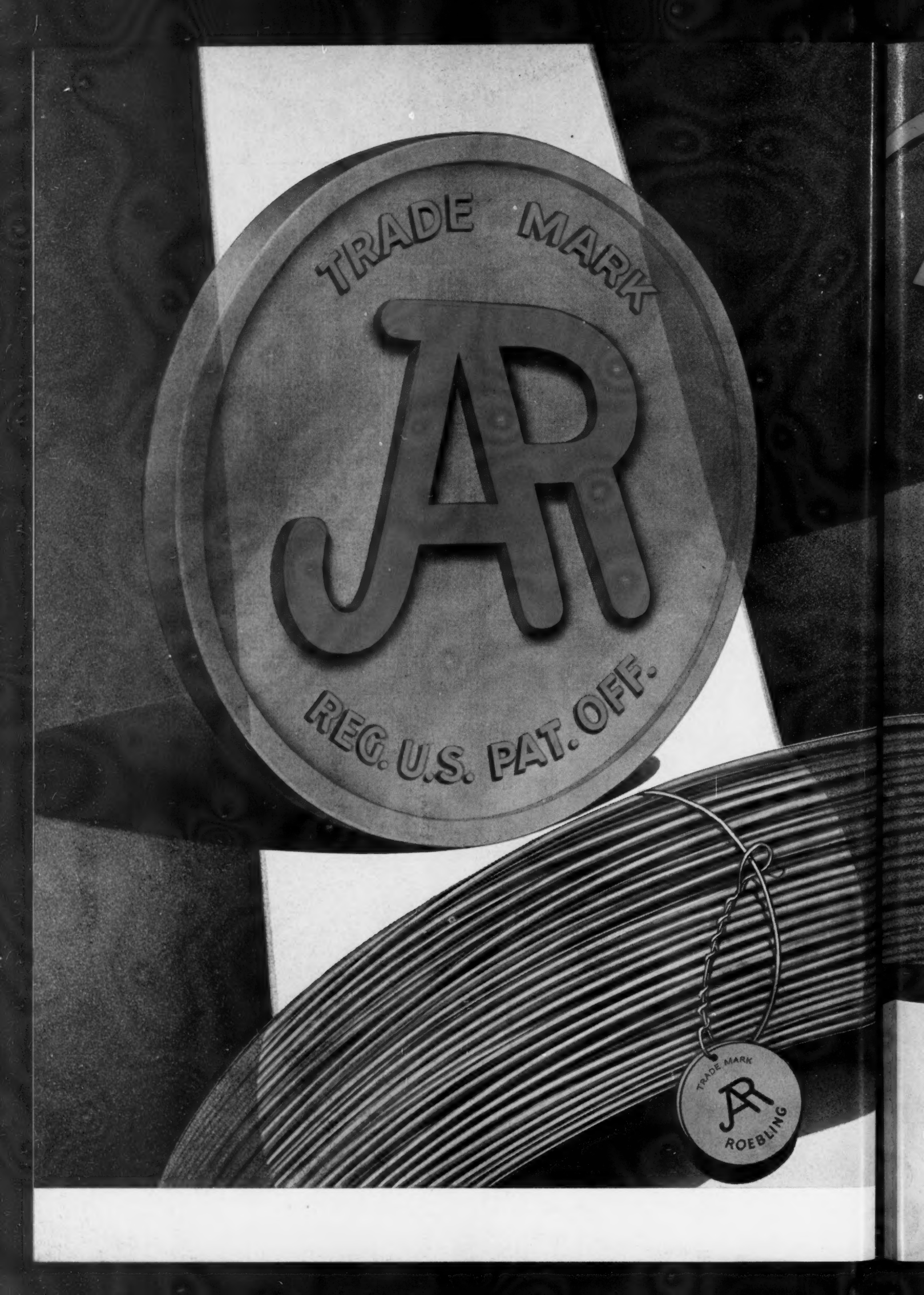
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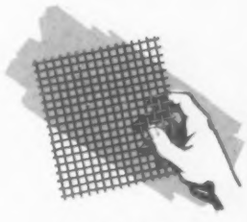

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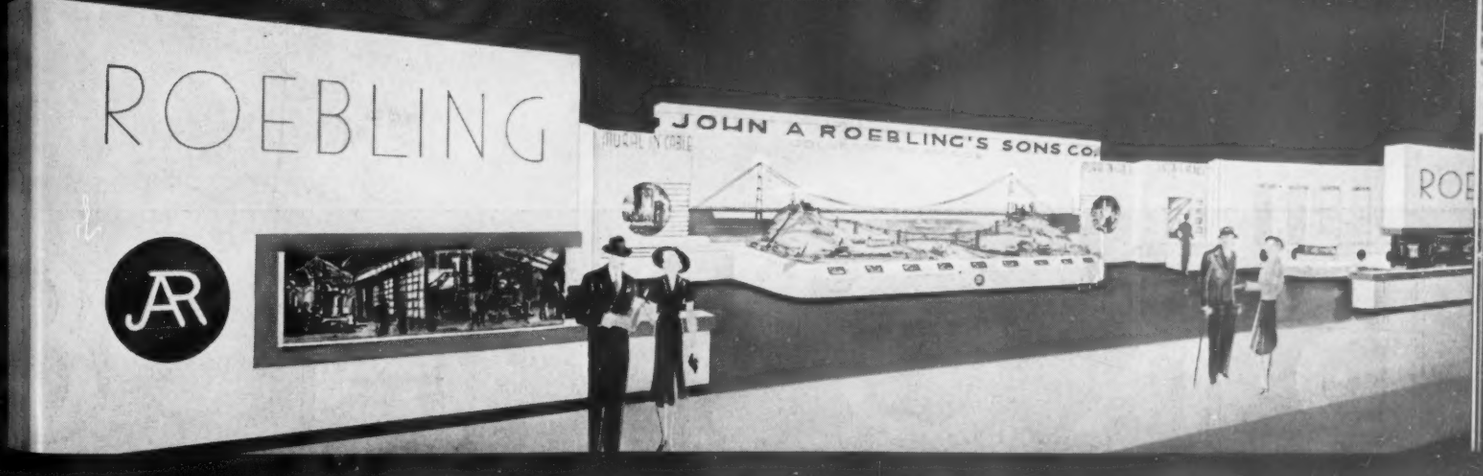

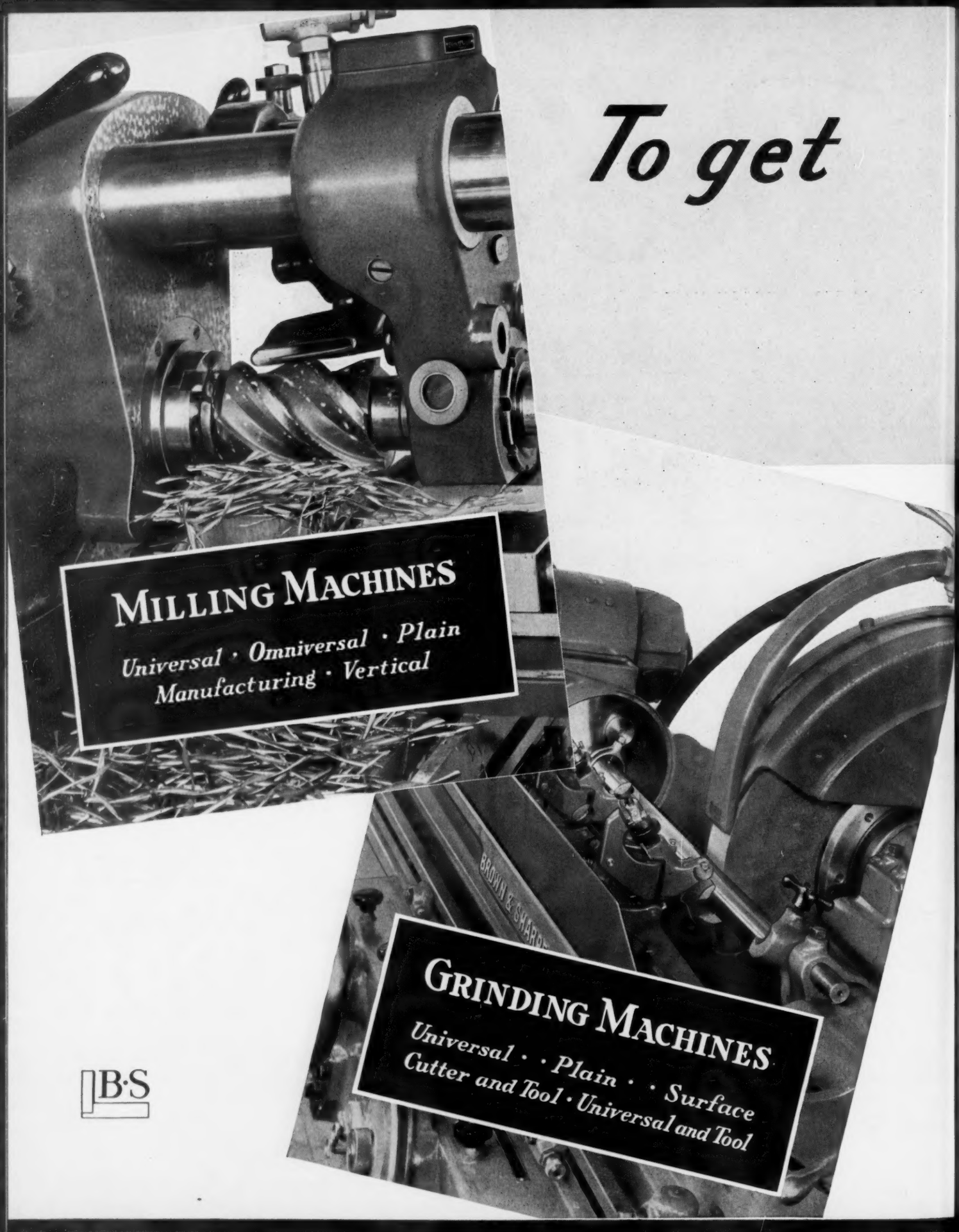
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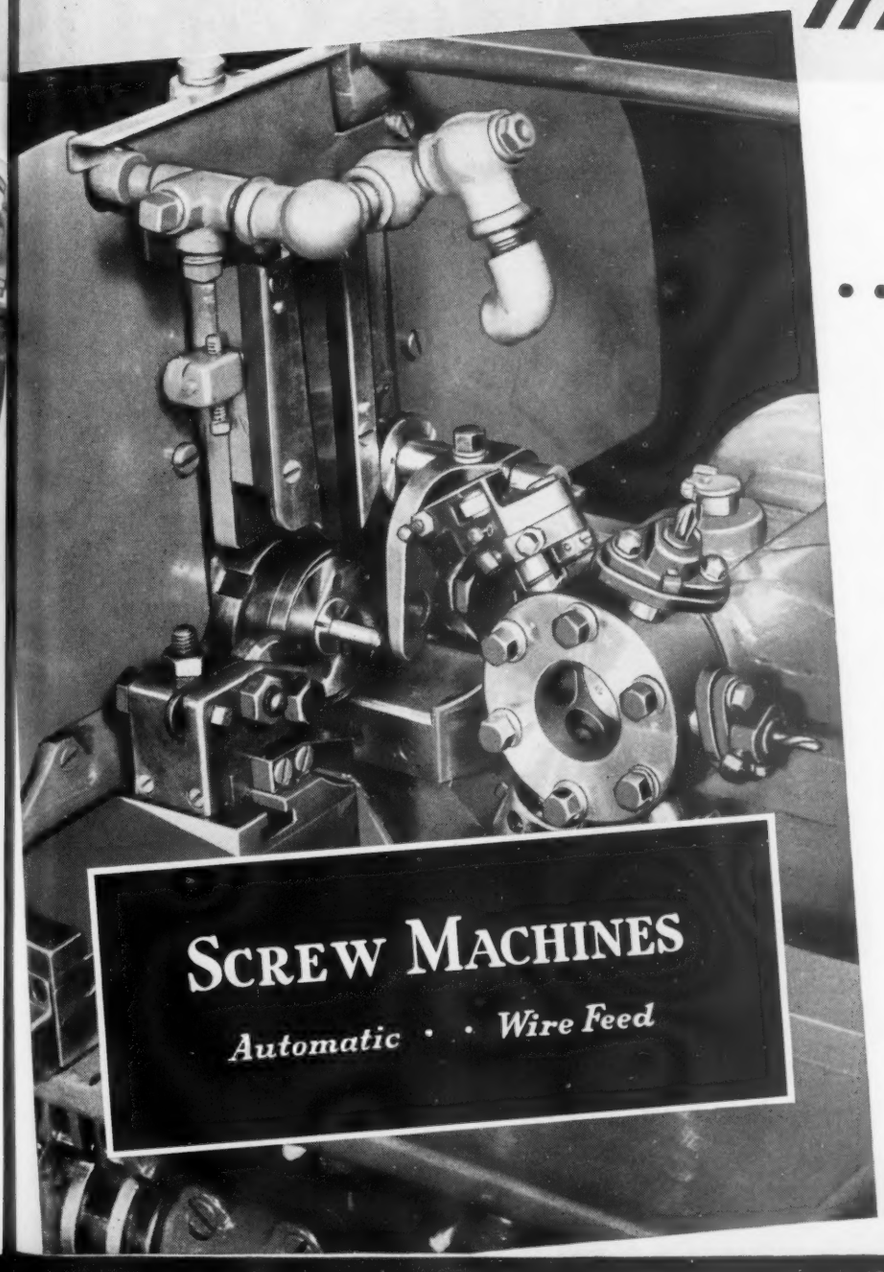

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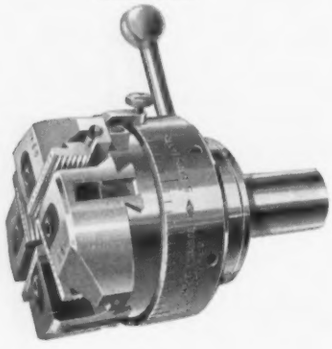
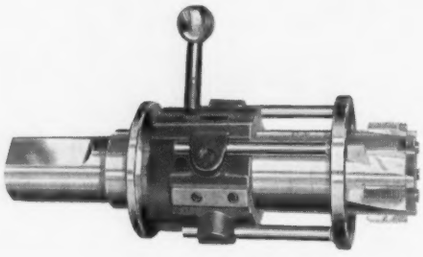
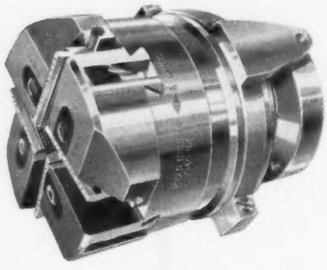
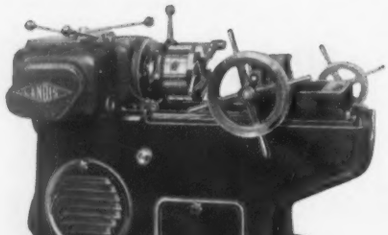


LANDIS Collapsible Taps for straight and Tapered Internal threading

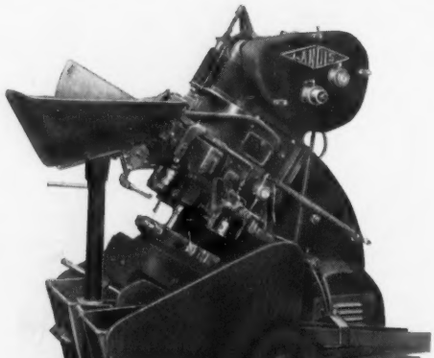


LANDEX Heads for Automatic Screw Machines





LANDMACO Threading Machines



Automatic Forming and Threading Machines

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For *Threads of* True Form

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Quality Finish

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CHASER GRINDERS
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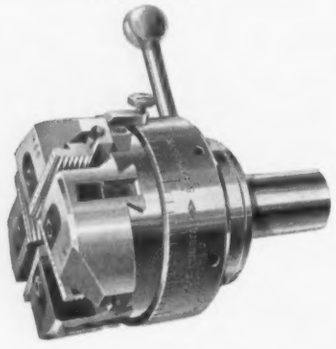
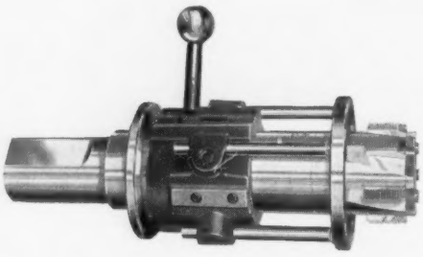
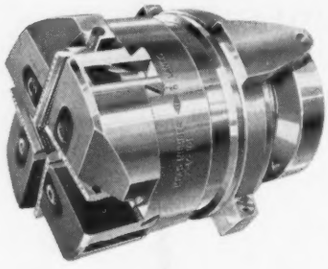


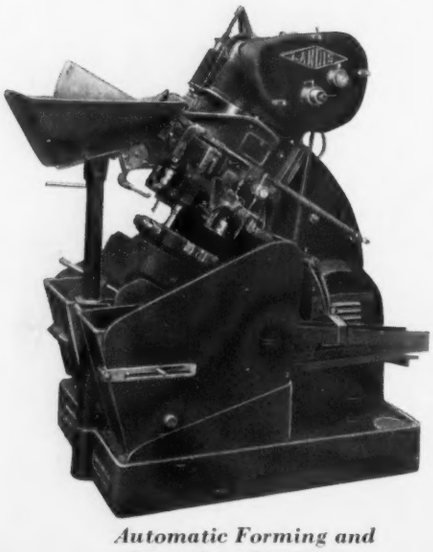
LANDIS Collapsible Taps for straight and Tapered Internal threading



LANDEX Heads for Automatic Screw Machines



LANDMACO Threading Machines



Automatic Forming and Threading Machines

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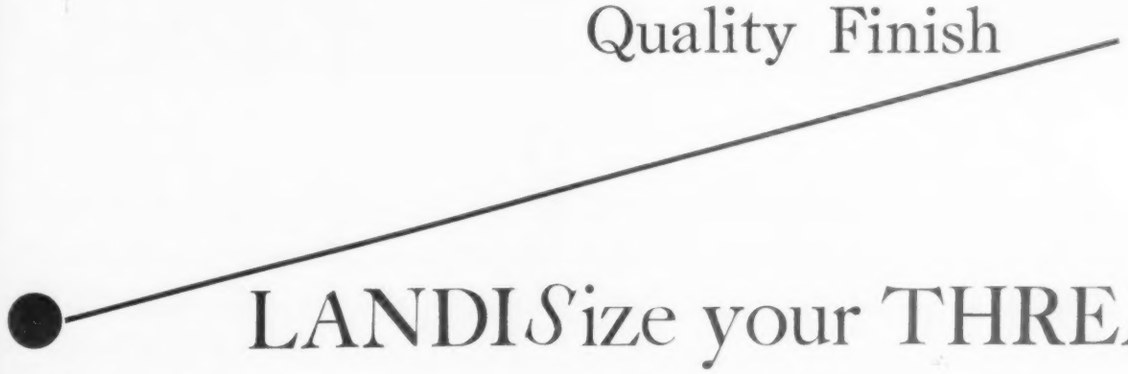

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"The man in the old battered hat you see operating this 'baby' furnace is a college graduate—a research metallurgist. His two helpers have been making quality steel all their lives in the tradition of craftsmanship built up by J & L over a period of 89 years. They can read temperatures by peering into a furnace—they can tell the carbon content of steel by looking at a broken sample—they are masters of the art of making fine quality steel.

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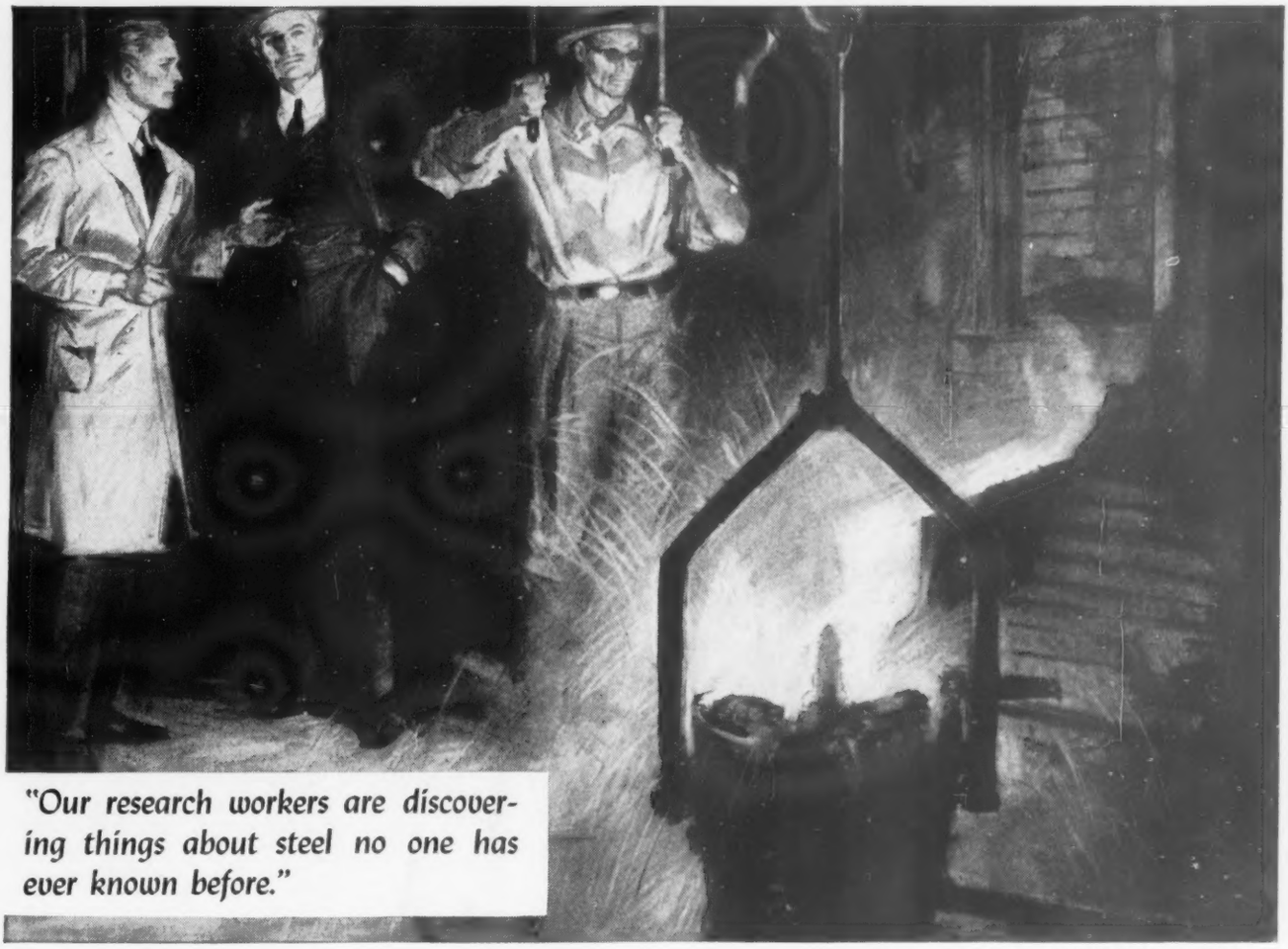


From a drawing by ORISON MacPHERSON

the molten steel of the furnaces, make experiments in the Pilot Plant, all to obtain complete control of quality in our commercial production. With the small experimental furnaces and pilot rolling mills in this laboratory, our research workers are discovering things about steel no one has ever known before.

"How does making steel by the pound help you customers who use it by the ton? By improving properties of steels for all your products—developing new steels—opening new fields for you through wider and more profitable use of J & L Controlled Quality Steel."

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS

PITTSBURGH, PENNSYLVANIA

J&L STEEL

J & L—PARTNER IN PROGRESS TO AMERICAN INDUSTRY

At

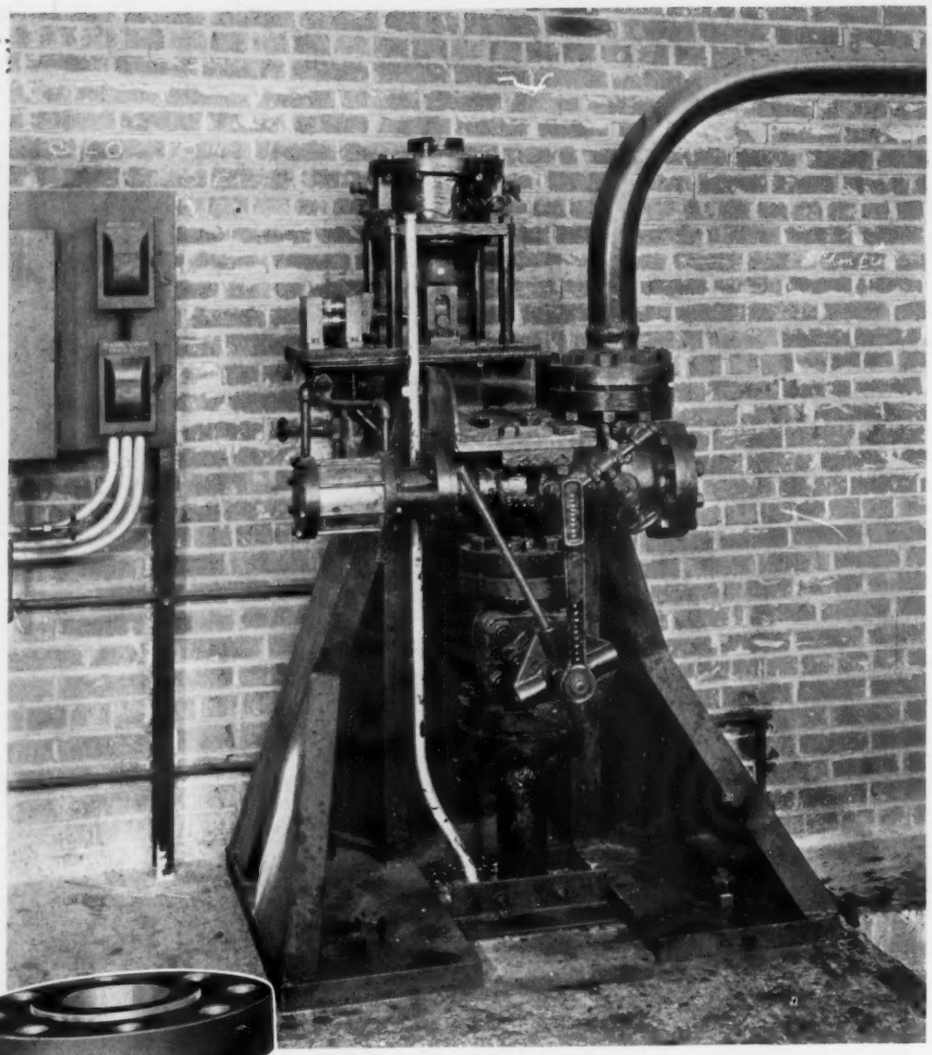
INLAND STEEL

HUNT

Quick-As-Wink

SPRAY VALVES

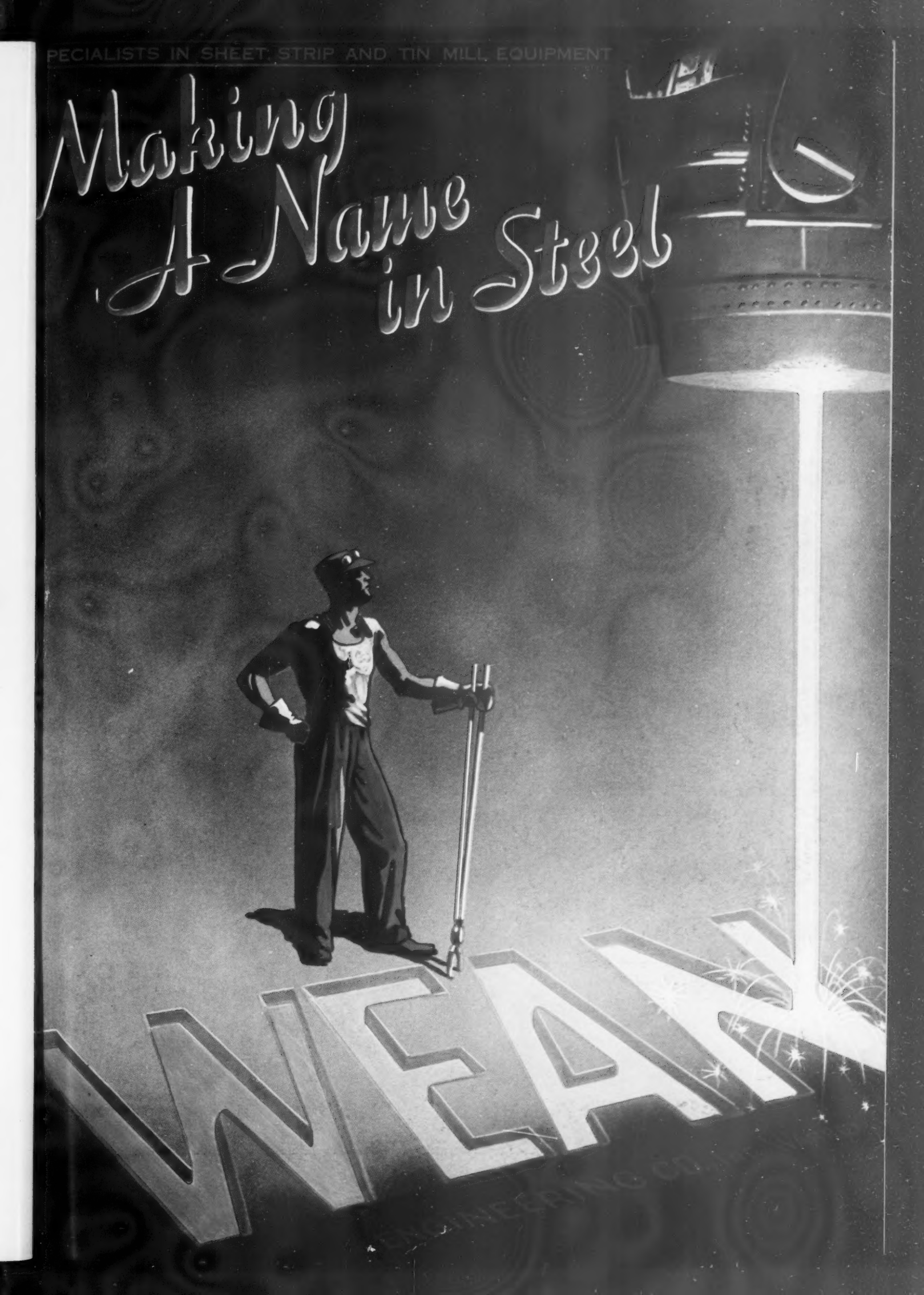
were installed for descaling service. Seven of these valves are installed at Inland's Indiana Harbor Plant. Each descaling valve is controlled by a specially designed solenoid air pilot valve.



POSITIVELY ELIMINATES WATER HAMMER

Only one moving part. No Metal-to-metal wear. Absolute regulation of operating speeds — opening or closing speed independently controlled at will. For 500 to 1500 pounds working pressure. Engineering data and other details on request.

C.B.HUNT & SON – SALEM,OHIO


PECIALISTS IN SHEET, STRIP AND TIN MILL EQUIPMENT
Making A Name in Steel
WEAN

Announcing THE NEW McKAY DRAWBENCHES

Drawbenches for steel and non-ferrous tubes and bars, with conventional electric drive or automatic AC or DC drive for slow starting and acceleration to the drawing speed.

Push button control initiates the completely automatic drawing cycle, automatic arms facilitating removal of the tube or bars.

The automatic draw grip permits quicker interchange of the draw bits for size and for multiple draw.

PATENT
APPLIED FOR

Faster grip return with automatic deceleration and air cushioned stop with positive positioning for gripping the tube or bar points, increases production and diminishes point scrap.

We solicit your inquiries for tube and bar drawbenches. We also build complete tube forming, sizing, welding and cut-off equipment.

Wallace W. Kerr, who has devoted the last 20 years to the development of drawbench machinery is now associated with McKay in the engineering and sales of their new line of drawbench machinery and equipment.

THE McKAY MACHINE CO

ENGINEERS AND MANUFACTURERS OF SHEET, TIN AND STRIP MILL EQUIPMEN

YOUNGSTOWN, OHIO

ASSOCIATED COMPANY

FREE

THE NEW BLANCHARD WORK BOOK

DONE ON THE BLANCHARD
Work
DONE ON THE BLANCHARD
Raising Block on No. 18-36" Chuck
THIS is a difficult job to do any way but on a Blanchard. The piece is of thin section and quite apt to spring if it is locked in a fixture strongly enough to hold it. The block is shimmed the first time and a clean-up cut is taken. It is then turned over and a light cut taken on the other side. This operation is repeated four or five times before it is finished.
Cast Iron
Stock per side 1/16"
Limits Must be parallel
No. Sides 2
2 pieces (4 surfaces) per hour
54
Slide Lifting Lever on No. 18-36" Chuck
AT FIRST glance this does not look like a job for the Blanchard on account of the projecting boss. The problem was solved simply enough. The lever is laid on the chuck so that the boss goes through the hole in the center of the chuck. The outer surface which is lower than the inner surface is ground. The wheel is then raised, the chuck moved in, and the inner surface is ground. The lever is then turned over and a .290" size block is placed under the ground forked end to make it level with the other end, and both surfaces are finished.
Cast Iron
Stock per side 1/16"
Limits .002
No. Sides 2
8 pieces (16 surfaces) per hour
Ball Bearing Spacers on No. 18-36" Chuck
18 large spacers with 18 small spacers inside of them are placed on the magnetic chuck. The pieces are held against the outer chuck ring and against each other. Two square blocks laid in the center of the chuck fill the gaps. In the inner row. This job was previously done on a small surface grinder and took about 20 minutes per pair. The operator offered this testimonial "You can say from me, that the feed on this machine is the most accurate I have ever seen."
Cast Iron
Stock per side .025"
Limits Must be parallel within .0002
No. Sides 2
36 large, 36 small pieces (144 surfaces) per hour
Bearing Caps on No. 18-36" Chuck
THESE pieces used to be milled, taking 35 minutes to finish. The Blanchard not only cut down production time on this job but also saves time in setting up and expense for fixtures. The caps are laid on two parallel bars on the Chuck. Smaller steel blocks are laid on top of them and against the caps. Two hollow steel rings against these blocks serve to hold the work sideways. A steel block is placed at each end and the magnetism is turned on. Simple, isn't it?
Cast Iron
Stock removed 1/8"
Limits .010
No. Sides 1
7 pieces per hour
DONE ON THE BLANCHARD
Work
DONE ON THE BLANCHARD
DONE ON THE BLANCHARD
Work
DONE ON THE BLANCHARD

Whether or not you now own a Blanchard Surface Grinder, the Blanchard Work Book will show you how to handle your surface grinding jobs more easily, accurately, and economically. There are 75 pages, spiral bound for your convenience, packed full of production data and information on grinding small or large lots. The coupon is for your convenience — Write for your Work Book TODAY!

COUPON

Without obligation, please send me the Blanchard Work Book.

NAME..... TITLE.....

COMPANY.....

CITY..... STATE.....

S

BLANCHARD
MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS.

THE SHENANGO FURNACE CO.

Lake Superior Iron Ores

Bessemer — Non-Bessemer

Aluminiferous

"Shenango" Pig Iron

Bessemer — Basic
Malleable — Foundry

SHENANGO-PENN MOLD CO.

Ingot Molds & Stools

Plant—Sharpsville, Pa.

Centrifugally Cast

Alloys of Bronze, Monel Metal, Nickel, Iron and Semi-Steel.

Rolls, Propeller Shaft Bearings, Bushings and Bearings.

Plant—Dover, Ohio

Write for Booklet

W. P. SNYDER & COMPANY

Established 1888

Iron Ore — Pig Iron
Coal — Coke

OLIVER BUILDING-PITTSBURGH

ACME MODEL "XN" CUSHIONED DRIVE INCREASES PRODUCTION AND LOWERS MAINTENANCE COSTS

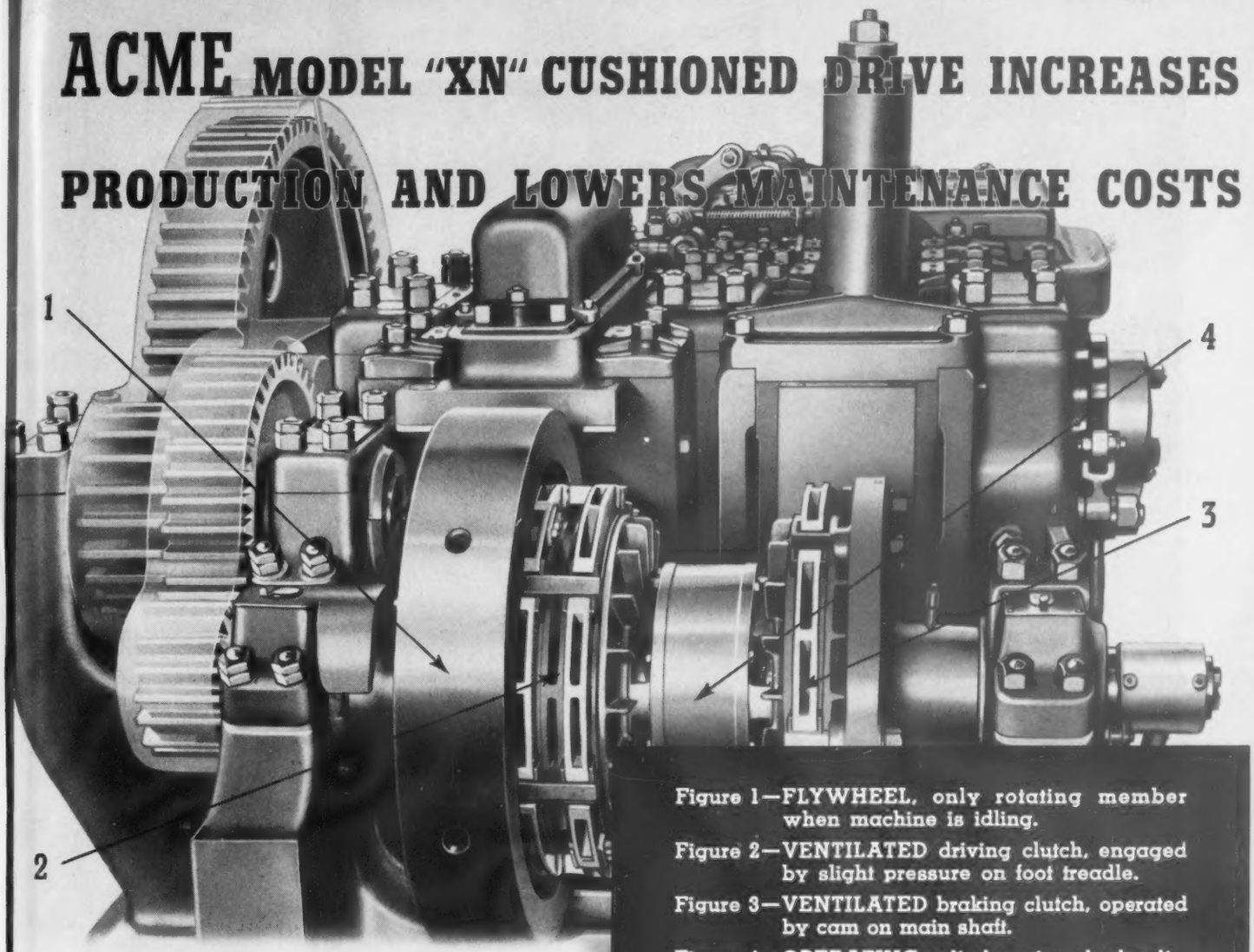


Figure 1—FLYWHEEL, only rotating member when machine is idling.

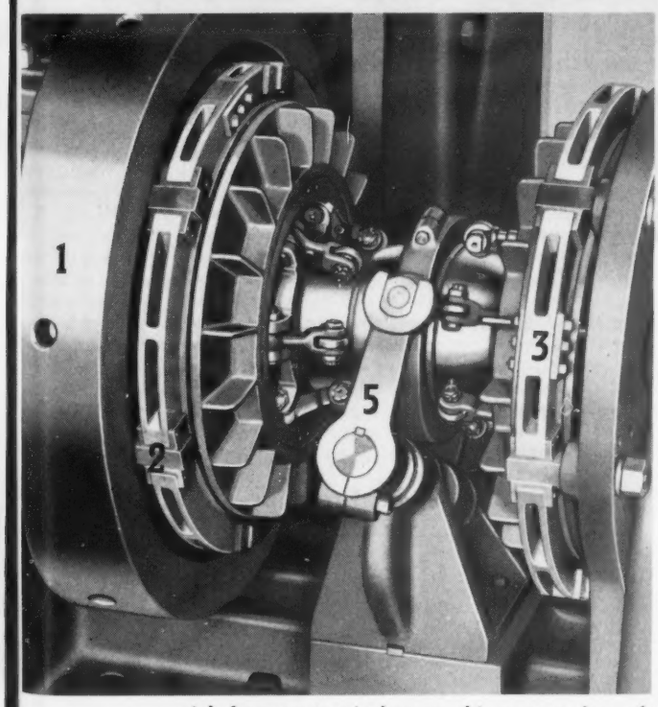
Figure 2—VENTILATED driving clutch, engaged by slight pressure on foot treadle.

Figure 3—VENTILATED braking clutch, operated by cam on main shaft.

Figure 4—OPERATING cylinder, air or hydraulic, for clutch and brake.

Figure 5—OPERATING mechanism for mechanical clutch and brake.

Mechanical, air or hydraulic operated clutch and brake are optional on all machines from 1-inch to 5-inch sizes.



● Instantaneous starting eliminates heat losses from stock being worked—contributes to higher production rate of better forgings. In the ACME Model XN heavy duty forging machines the ACME Cushioned Drive is no mere figure of speech—it is a major improvement in forging machine construction. Only a *slight pressure* on foot treadle to engage either mechanical, air, or hydraulic clutch starts the machine. No time is lost for the ACME drive does not require a partial revolution of main shaft or driving gear before starting. If machine stalls, due to over-load, clutch cushions stopping of fly-wheel, eliminating any shock to machine frame, main shaft or motor. The new ACME machine is virtually noiseless and vibrationless in operation, due to the combination of cushioned drive and eccentric sliding head movement, which keeps maintenance at a minimum. ACME clutches are of rugged construction, having large friction surfaces of durable material, and clutch discs made of a high grade aluminum alloy, cored in center to allow constant circulation of air to keep clutch temperature low at all times.

Ask for more particulars on this most modern of today's forging machines, and let us assist you on your forging problems.

THE ACME MACHINERY COMPANY

Established 1882

4535 ST. CLAIR AVENUE

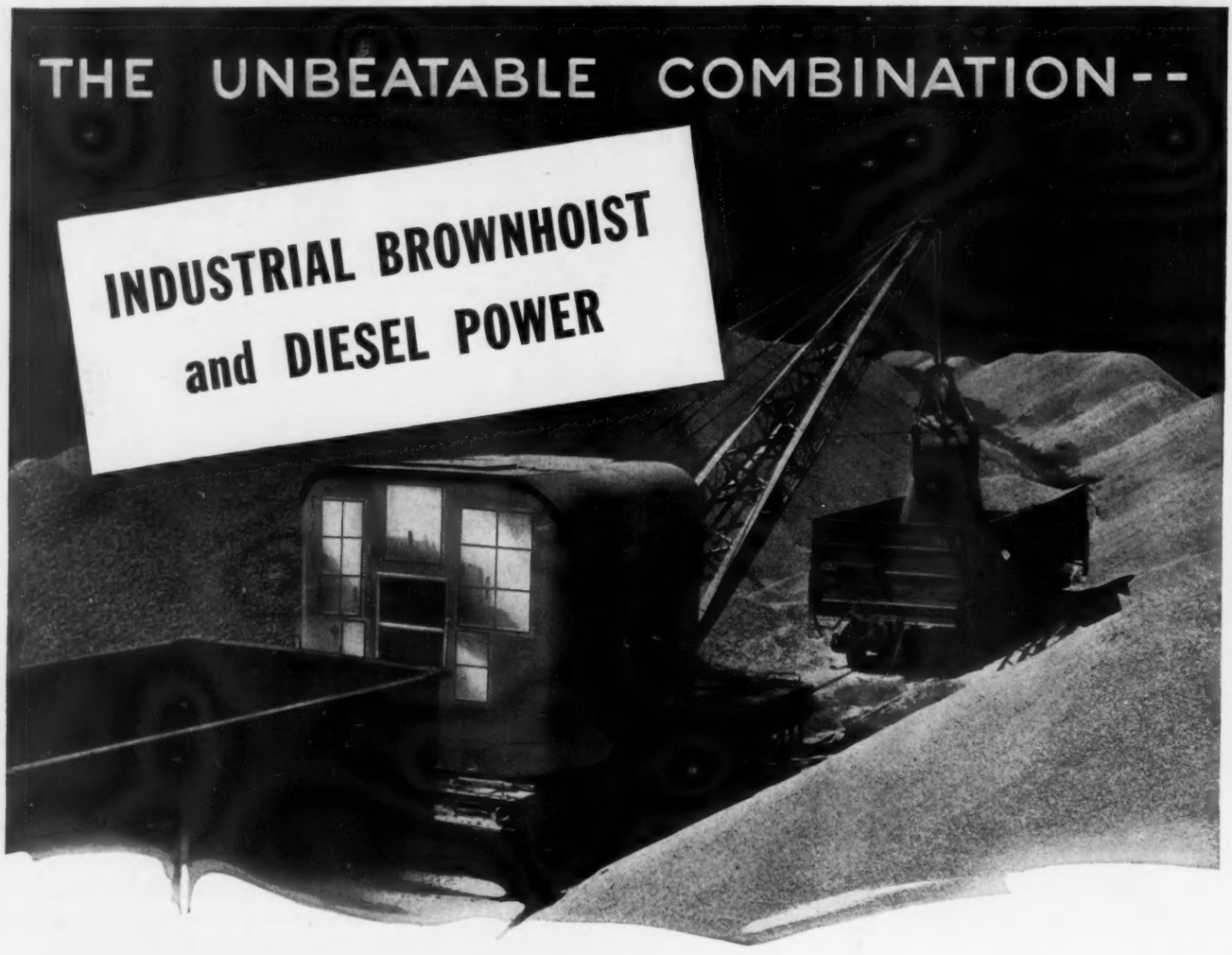
Cleveland, Ohio

FORGING • THREADING • TAPPING

BOLT • NUT • RIVET MACHINES

THE UNBEATABLE COMBINATION--

INDUSTRIAL BROWNHOIST and DIESEL POWER



Crane owners who think they are money ahead by "getting along" with their present equipment just aren't familiar with the new Industrial Brownhoist models. Here are a few facts about them worth considering.

The new Industrial Brownhoist Diesel cranes are more ruggedly built and are averaging 20% bigger output per day at a saving of 20% to 40% in fuel costs over the cranes they replaced. The Diesel, moreover, is one-man operated and has more speed and power for switching service than most plants ever require.

With business looking up and more work to do, now is a good time to bring down handling costs. Compare your present figures with those of some Industrial Brownhoist Diesel owners who are using their cranes for work similar to yours. We will be glad to give you this data and complete information on the right size crane for your plant.

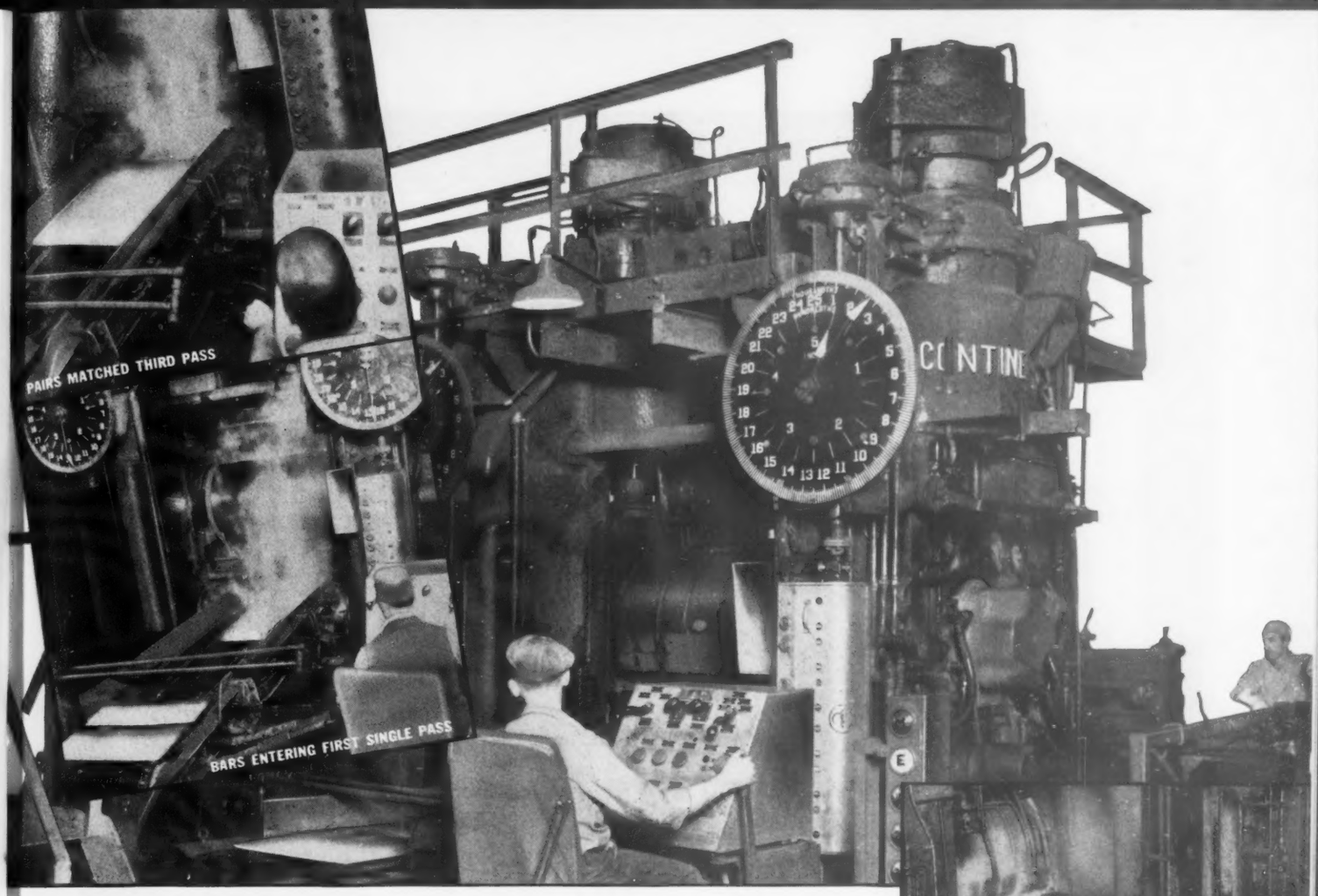
LOCOMOTIVE CRANES, 10 TO 200 TONS CAPACITY
CRAWLER CRANES, 6 TO 25 TONS CAPACITY
ERECTION CRANES, 10 TO 75 TONS CAPACITY
ORE AND COAL HANDLING BRIDGES
CAR DUMPERS FOR COAL AND ORE
CLAMSHELL BUCKETS

INDUSTRIAL BROWNHOIST

GENERAL OFFICES: BAY CITY, MICHIGAN

DISTRICT OFFICES

New York, Philadelphia, Pittsburgh, Cleveland, Chicago,
Agents in Other Principal Cities



CONTINENTAL 3-HIGH MILL

More Accurate Gauge in Less Time . . . Greater Tonnage at Lower Cost

Steel plants, not equipped with continuous hot strip mills, now have the answer to the problem of reducing cost of finished sheets and improving rolling methods. For Continental has pioneered the development of a remarkable 3-high balanced roughing mill that represents a very low initial investment compared to the continuous strip mill installation. This new mill is designed to produce 4 pairs a minute . . . averaging 1800 pairs per eight hour turn, based on five passes per pair. Handles sheet bars from $\frac{5}{8}$" to 2" thick, 8" to 16" wide and up to 52" long. Embodies all the latest mechanical and electrical features: Motor-driven screwdown and pre-set control for speed and accuracy in pass setting. Pneumatic type middle roll balance insures against roll breakage by automatic control connected to tables. New type friction pinion for driving top roll permits variable slippage control, adjustable while mill is in operation. Advanced type Continental automatic feeder and catcher tables provide high-speed operation . . . catcher tables raised or lowered in only 3-10 second. Unique construction allows for rapid roll replacement . . . only 5 to 7 minutes for working roll. Pinion teeth and bearings of liberal proportions. Centralized pressure lubrication system. No detail has been overlooked for easy operation, accuracy of gauge and maximum tonnage at low cost.

AUTOMATIC TABLE WITH FINGER-TIP CONTROL

Operators of automatic feeder and catcher tables conveniently seated in full view of work, with electric control box in front of them. Hand levers actuate side guards and stops; foot pedals and palm-operated push buttons control delivery of pairs from furnace, and operation of tables and screwdown. Signal lights afford automatic check of every operation.

ANOTHER FIRST FOR CONTINENTAL

CONTINENTAL—HUBBARD DIV., EAST CHICAGO, IND.

CONTINENTAL—DUQUESNE DIV., CORAOPOLIS, PA.

CONTINENTAL Wheeling Division | Peninsula Plant Warwood Plant Wheeling, W. Va.

4 PLANTS SERVING THE STEEL INDUSTRY

CONTINENTAL ROLL & STEEL FOUNDRY COMPANY

Manufacturers of Rolling Mill Equipment, including Steel and Alloy Steel Castings, Iron and Alloy Iron Rolls, Steel and Alloy Steel Rolls

CHICAGO, ILL. and PITTSBURGH, PA.

Continental Direct Fired Annealing Furnaces
Continental Universal Industrial Gas Burners
Pittsburgh-Continental Annealing Covers

WE THE MEMBERS OF THE

AMERICAN HOT DIP

GALVANIZERS ASSOCIATION, INC.

are pledged

TO PROVIDE THE MAXIMUM PROTECTION AGAINST RUST AT THE MINIMUM COST—

Acme Galvanizing, Inc., Milwaukee, Wisconsin
Acme Steel & Malleable Iron Works, Buffalo, New York
American Tinning & Galvanizing Co., Erie, Pennsylvania
Atlantic Stamping Co., Rochester, New York
Buffalo Galvanizing & Tinning Wks., Inc., Buffalo, New York
Columbian Steel Tank Company, Kansas City, Missouri
Diamond Expansion Bolt Co., Inc., Garwood, New Jersey
Enterprise Galvanizing Co., Philadelphia, Pennsylvania
The Fanner Mfg. Co., Cleveland, Ohio
John Finn Metal Works, San Francisco, California
Thomas Gregory Galvanizing Works, Maspeth, New York
Hanlon-Gregory Galvanizing Co., Pittsburgh, Pennsylvania
The Hodell Chain Company, Cleveland, Ohio
Independent Galvanizing Co., Newark, New Jersey
International Derrick & Equipment Co., Columbus, Ohio
Joslyn Co. of California, Los Angeles, California
Joslyn Mfg. & Supply Co., Chicago, Ill.
L. O. Koven & Brother, Inc., Jersey City, New Jersey
Lehigh Structural Steel Co., Allentown, Pennsylvania
Missouri Rolling Mill Corp., St. Louis, Missouri
The National Telephone Supply Co., Cleveland, Ohio
Penn Galvanizing Co., Philadelphia, Pennsylvania
Riverside Foundry & Galvanizing Co., Kalamazoo, Michigan
San Francisco Galvanizing Works, San Francisco, California
The Sanitary Tinning Co., Cleveland, Ohio
Standard Galvanizing Co., Chicago, Illinois
Wilcox, Crittenden & Co., Inc., Middletown, Connecticut
The Witt Cornice Co., Cincinnati, Ohio

MEMBERS OF THIS ASSOCIATION ARE DEDICATED

(1) To the development of larger markets for iron and steel products by proving that rust can no longer be a reason for the use of weaker substitute materials.
(2) To the increased service and satisfaction given by iron and steel products by demonstrating that the right kind of galvanizing guarantees a much longer life at a much lower cost.
(3) To the constant improvement of galvanizing processes through laboratory research and the combined practical findings of our members.
(4) To adhere rigidly to our standard specifications which represent the highest standards of workmanship and thickness of zinc coating.
(5) To the exclusive use of the genuine Hot Dip Galvanizing process as the proved method of obtaining maximum protection at minimum cost.

Where rust is a factor

NOTHING SERVES SO LONG FOR SO LITTLE AS HOT DIP GALVANIZING!

Because the most economical and practical protection known to modern science for iron and steel is zinc and the Hot Dip Process is the best method of applying zinc.

Because the degree of protection provided is in direct proportion to the thickness of the coating and Hot Dipping assures a thicker coating—approximately 2½ ounces of zinc per square foot of surface.

Because Hot Dipping demands the use of molten zinc which fuses into the iron or steel surface and becomes an integral and inseparable part of the product beneath.

Because Hot Dipping means the complete immersion of the article in a molten bath and guarantees a complete, uniform coverage of all surfaces.

Write for our Booklet and Specification Sheet and learn the truth about Galvanizing. This knowledge will help you to get greater galvanizing results for less money.

IF IT CARRIES THIS SEAL

IT'S A JOB WELL DONE

AMERICAN
HOT DIP GALVANIZERS
ASSOCIATION INCORPORATED

AMERICAN BANK BUILDING · PITTSBURGH, PA.

Where rust may mean disaster HOT-DIP GALVANIZING is needed

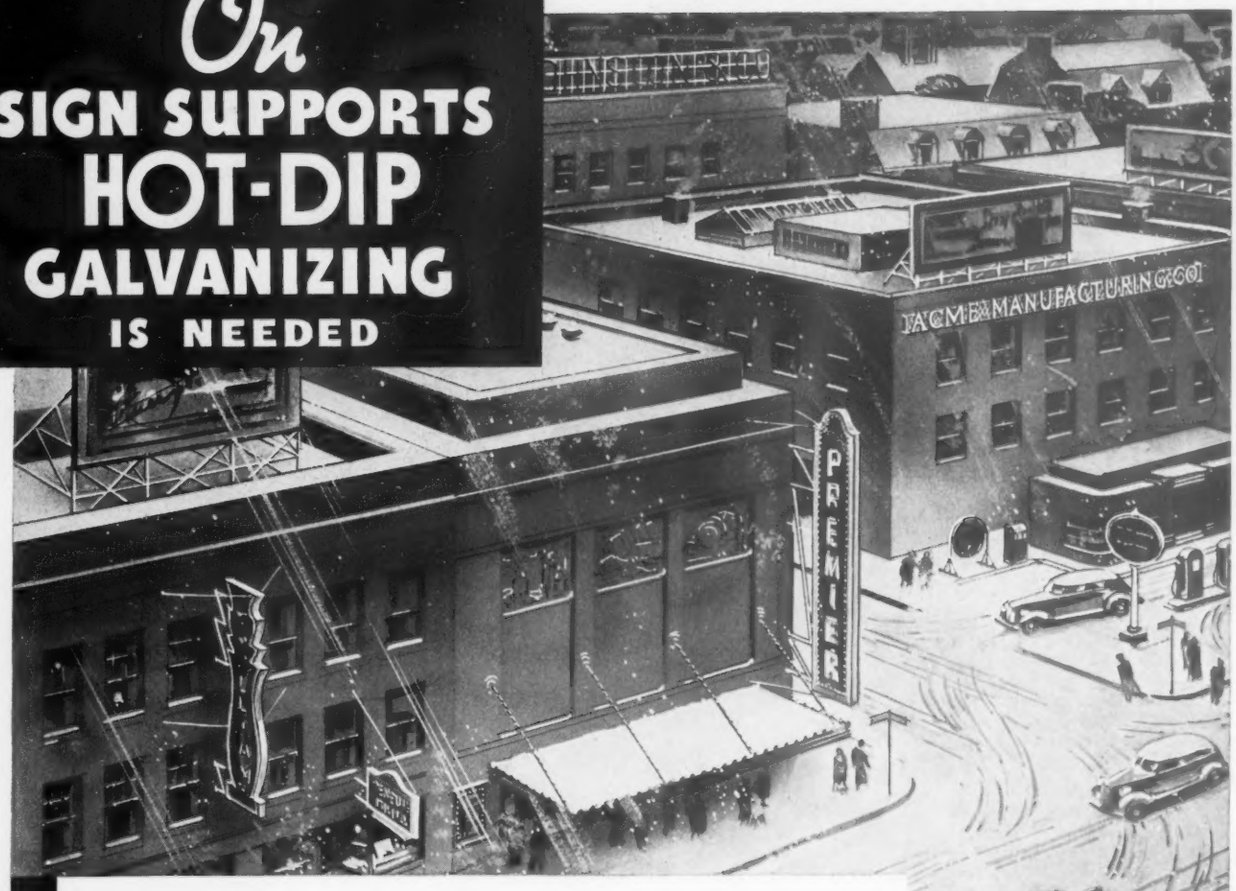
Rust is no sentimentalist. It has already caused too many accidents. In bleachers, playground equipment and structural steel athletic fixtures, there is no substitute for perfect protection . . . Only Hot Dip Galvanizing guarantees an adequately thick coating of zinc and a union between zinc coating and base metal which makes each an inseparable part of the other . . . Metallurgists will tell you that nothing serves so long for so little as Hot Dip Galvanizing. Patronize members of this association and *know* that you are getting a perfect job every time . . . Write us for literature and learn the truth about galvanizing. American Hot Dip Galvanizers Association Incorporated, American Bank Building, Pittsburgh, Pa.

These Products Require Hot Dip Galvanizing:

All structural steel used in bleachers and grandstands, seat supports, handrails and gates, tennis and baseball backstop frames, goal posts, fences and scoreboard reinforcements, spotlight braces, racks and lockers, gymnasium equipment, linemen's markers, judges' chairs, diving board implacements, all pipe used outdoors and mesh fence . . . Write for specification sheet.

IF IT CARRIES THIS SEAL IT'S A JOB WELL DONE

On SIGN SUPPORTS HOT-DIP GALVANIZING IS NEEDED



Where rust climbs to inaccessible spots, where painting and inspection are difficult, where iron and steel are constantly exposed to wind and weather, and where failure due to rust may mean death to pedestrians . . . there Hot Dip Galvanizing demonstrates conclusively that it is the longest wearing, lowest cost protection known to modern science . . . Several state laws specifically read that all steel work on overhanging signs and billboards be galvanized . . . On structural supports, chains, bolts, nuts and strap fastenings, Hot Dip Galvanizing done by members of this association assures a thick layer of molten zinc which penetrates the surface and becomes an actual part of the product, giving a complete coverage of crevices and corners and guaranteeing perfect workmanship in every respect. Write for our literature. American Hot Dip Galvanizers Association Incorporated, American Bank Building, Pittsburgh, Pa.

IF IT CARRIES THIS SEAL IT'S A JOB WELL DONE

OFFICIAL • INSIGNIA
HOT-DIP GALVANIZING
AMERICAN HOT DIP GALVANIZERS ASSOCIATION INC.

These Products Require Hot Dip Galvanizing:

All steel sign supports or braces, angles, pipe, chain, rings, strap fastenings and sheet metal faces as well as bolts, nuts and rivets . . . Also skylight frames, structural supports for water tanks, gutters and rain spouts, window gratings, awning and marquee hardware, lightning rods, smokestacks, ventilators, flagpoles, ornamental ironwork . . . Write for specification sheet.

Where RUST rides the roads HOT-DIP GALVANIZING is needed

With the development of our elaborate highway systems, come heavy repair and maintenance costs. Steel must replace weaker materials and hot dip galvanizing must close these roads to rust . . . In concrete armoring, safety guards, poles, posts, railings, curb bars, culverts and light hardware, hot dip galvanized steel unquestionably serves more efficiently and at less cost . . . Patronize members of this association and know that you are getting a quality hot dip job handled by expert personnel in a modernly equipped plant . . . American Hot Dip Galvanizers Association, Inc., American Bank Building, Pittsburgh, Pa.

IF IT CARRIES THIS SEAL IT'S A JOB WELL DONE

These Products Require Hot Dip Galvanizing:

Steel road guards, curb bars, sewer steps, safety zone railings, irrigation and drainage pipe, road sign posts and ornamental lighting poles, railroad crossing plates, concrete armoring and open bridge flooring, culverts, billboard frames and braces, spikes and steel railroad ties, splice bars and fish-bars as well as equipment for refrigerator cars . . . Write for specification sheet.

Where steel meets weather
HOT-DIP GALVANIZING *is needed*

In the outdoors, nothing serves so efficiently—for so long—for so little—as Hot Galvanized Steel . . . Structural work, grating, bolts and nuts, every item in which rust is a serious menace needs the natural and economical protection of Hot Dip Galvanizing . . . Members of this Association employ expert personnel and operate the most up-to-date shops in the industry; they guarantee you a quality hot dip job every time and approximately two and one-half ounces of zinc on every square foot of surface . . . American Hot Dip Galvanizers Association, Inc., American Bank Building, Pittsburgh, Pa.

IF IT CARRIES THIS SEAL IT'S A JOB WELL DONE

OFFICIAL • INSIGNIA
PROTECTED BY GENUINE HOT-DIP GALVANIZING
AMERICAN HOT DIP GALVANIZERS ASSOCIATION, INC.

These Products Require Hot Dip Galvanizing:

All structural steel and hardware used in transmission towers, beacon towers, observation towers, water towers, radio towers, oil derricks and bridges, steel scaffolding, pole line hardware, crane arms, booms and runways, ladders, outdoor substations and tanks, barrels, reels and drums, chain, steel poles and plates, ship and dock fittings, buoys and railings . . . Write for specification sheet.

Where danger lurks IN RUST HOT-DIP GALVANIZING is needed

Rust does its greatest damage in nooks and crannies where painters can't reach, where inspectors cannot see, in vital spots where metal failure means disaster . . . The most practical and economical rust preventive known to modern science is Hot Dip Galvanizing because in the hot dipping process, the molten zinc flows into and fills every crevice and leaves an even coating of approximately two and one-half ounces of zinc on every square foot of surface . . . A coating that is constantly demonstrating its greater durability per dollar . . . Buy from the qualified members of this Association listed below and know that you are getting a quality hot dip job every time . . . American Hot Dip Galvanizers Assn., Inc., American Bank Bldg., Pittsburgh, Pa.

IF IT CARRIES THIS SEAL IT'S A JOB WELL DONE

OFFICIAL • INSIGNIA
PROTECTED BY GENUINE HOT-DIP GALVANIZING
AMERICAN HOT DIP GALVANIZERS ASSOCIATION, INC.

These Products Require Hot Dip Galvanizing:

Steel window sash and skylights, fire escapes, catwalks, fire doors, building anchors, boilers, gratings, water heaters, greenhouse material, I beams, nuts, bolts, washers, screws, nails and rivets, ornamental ironwork, garbage cans, refrigeration systems, brewery, laundry and power plant equipment, cellar doors, handrails, step treads and steel flooring . . . Write for specification sheet.

BUY

FROM THESE QUALIFIED MEMBERS OF THE AMERICAN HOT DIP GALVANIZERS ASSOCIATION

KNOW

THAT YOU ARE GETTING THE MOST FOR YOUR MONEY

Acme Galvanizing, Inc. . . . . Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N.Y.
American Tinning & Galvanizing Co. . . . . Erie, Pa.
Atlantic Stamping Co. . . . . Rochester, N.Y.
Buffalo Galv. & Tinning Works, Inc., Buffalo, N.Y.
Columbian Steel Tank Company, Kansas City, Mo.
Diamond Expansion Bolt Co., Inc., Garwood, N.J.
Enterprise Galvanizing Co. . . . . Philadelphia, Pa.
The Fanner Mfg. Company . . . . . Cleveland, Ohio
John Finn Metal Works . . . . . San Francisco, Calif.
Thomas Gregory Galvanizing Works, Maspeth, N.Y.
Hanlon-Gregory Galvanizing Co. . . Pittsburgh, Pa.
The Hodell Chain Company . . . . . Cleveland, Ohio
Independent Galvanizing Co. . . . . Newark, N.J.
International Derrick & Equip. Co., Columbus, Ohio
Joslyn Co. of California . . . . . Los Angeles, Calif.
Joslyn Mfg. & Supply Co. . . . . Chicago, Ill.
L. O. Koven & Brother, Inc. . . . . Jersey City, N.J.
Lehigh Structural Steel Co. . . . . Allentown, Pa.
Missouri Rolling Mill Corp. . . . . St. Louis, Mo.
The National Telephone Supply Co., Cleveland, O.
Penn Galvanizing Co. . . . . Philadelphia, Pa.
Riverside Fdy. & Galvanizing Co., Kalamazoo, Mich.
San Francisco Galv. Works, San Francisco, Calif.
The Sanitary Tinning Co. . . . . Cleveland, Ohio
Standard Galvanizing Co. . . . . Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
The Witt Cornice Co. . . . . Cincinnati, Ohio

WRITE US FOR SPECIFICATION SHEET

IF IT CARRIES THIS SEAL

IT'S A JOB WELL DONE

His tax paid.. by "Maxi" Taps

"Maxi" taps saved enough on one job to pay the year's social security taxes of a certain midwest manufacturer.

He was tapping a tough job in High Sulphur Steel and getting an average of 800 to 1,000 holes per tap. "Maxi" taps were substituted on the same job and under the same operating conditions, are averaging 25,000 holes per tap.

Of course, we do not claim that "Maxi" High Speed taps will always give 25 times greater production. But they have certainly turned in some amazing records on stringy or abrasive materials. It's due to the special surface treatment developed by "Greenfield" for just such jobs. If your tapping production seems to be limping—better try "Maxi" taps. "Maxi" taps are identified by their jet black finish.

GREENFIELD TAP & DIE CORPORATION, GREENFIELD, MASSACHUSETTS

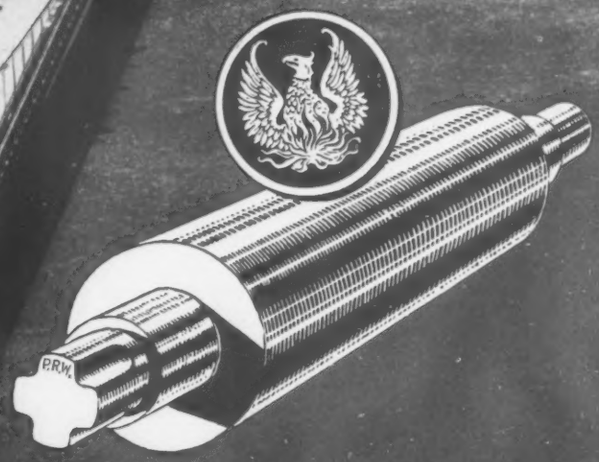
Detroit Plant: 2102 West Fort St.; Warehouses in New York, Chicago, Los Angeles and San Francisco; In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

GREENFIELD

"GREENFIELD" TAPS DIES · DRILLS SCREW PLATES PIPE TOOLS REAMERS GAGES SOLD BY DISTRIBUTORS EVERYWHERE

Mark of the Artist

The bridge etched against the blue of the sea is a masterpiece . . . with the stamp of the artist-engineer who created it. You see this stamp on each Phoenix Roll. It has been there ever since the first one was made, and it expresses itself in longer life, better work, lower cost. It is the reason for the leadership of Phoenix in the roll-making art.



The Golden Gate Bridge, flung across the entrance to San Francisco Bay, is one of the wonders of the modern world . . . in its beauty and utility a true work of an artist-engineer. Its main span is 4200 feet — longest in existence. More than 80,000 miles of wire cable are used. Total length 9,200 feet. Clearance above water 266 feet.

The Mark of Quality

PITTSBURGH ROLLS

Division of

BLAW-KNOX CO.

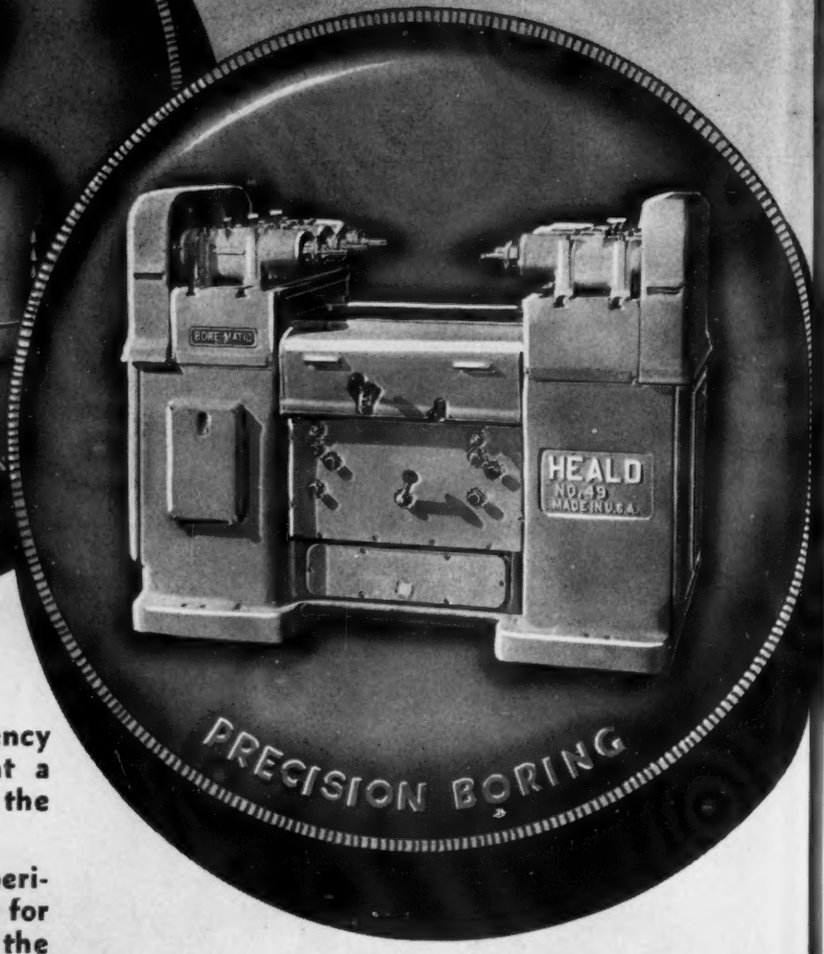
Pittsburgh, Pa.

"Steel's Partner"

ROLL MAKING IS AN ART

Mint NEW PROFITS in 1939

WITH A HEALD



THE demands of today for greater efficiency in all products can only be obtained at a reduced manufacturing cost by use of the proper equipment.

Heald offers a background of 35 years experience designing and building machines for precision finishing work of all kinds the world over.

Our entire organization of engineers and mechanics are at your service to help you solve any problem relative to Precision Grinding or Boring.

THE HEALD MACHINE COMPANY
WORCESTER, MASSACHUSETTS, U. S. A.

DISTINGUISHED SERVICES rendered by Elwell-Parkers during 1938 in Reducing load-handling costs in Principal Industries

Machine Tool. Warner & Swasey's 50,000th Turret Lathe (see photograph) transported from Erecting Shop to Shipping Department on one of their latest Elwell-Parker Trucks, which handle an increasing volume of goods. These Trucks have been built for 33 years within 2 miles of the Warner & Swasey plant.

Steel. **(1)**—New attachment designed for use on standard Elwell-Parker Crane chassis for unique, money-saving operation during ingot production. **(2)**—Elwell-Parker Equipment was ordered for 2 of the 3 new strip mills put into operation during 1938.

Stokers. Nationally-prominent concern applies Elwell-Parker Crane to storing steel prior to fabrication. Though performing other work in addition, Crane will pay for itself on this one operation in 8 months.

Wire. World-famous producer of fasteners employs Elwell-Parker Lift Truck to unload processed wire from boxcars; to high-pile in storage; and to reclaim as required. Handling time cut 75%; useable space more than quadrupled in existing warehouse.

Paper. **(1)**—Elwell-Parker Fork Trucks pick up stout wooden pallets carrying 72" rolls of newsprint; tier 3 high (18 ft.) to warehouse roof. **(2)**—Special Elwell-Parker Truck with revolving attachment picks up heavy rolls of print stock at shipside; transports directly into warehouse, rotating each roll 90 deg.—vertical to horizontal position, or reverse—if desired. **(3)**—Elwell-Parker Crane in a large fiberboard mill builds up reserves of baled waste—unloads from road trucks and tiers to roof; then reclaims and delivers bales to beater platform. **(4)**—An Elwell-Parker with special body, dumps 5-ton batches of fiber pulp into beater.

Rubber. Analyses by Elwell-Parker Engineers of load-handling in a key plant in the "Big 4 Group" resulted in the purchase of Elwell-Parkers to handle materials, beginning with crude rubber. Important savings were immediately established and maintained.

Textiles. A major rayon project of the year transports bulky loads on Elwell-Parker Lift Truck. Man rides up with load, controlling hoist operation with push-button when high stacking.

Insulation. One of America's largest corporations conveys finished units of wall insulation from processing through warehousing (tiering to roof); to loading dock and freight cars, with Elwell-Parker System.

★ ★ ★

New, ingenious, profit-saving methods of handling industrial loads without waste are developing continually from Elwell-Parker's great reserve of Engineering Experience. You need now the tangible, net reductions in manufacturing costs that an Elwell-Parker *System* can give you. Send for an Elwell-Parker Engineer—write air mail today or WIRE COLLECT. The Elwell-Parker Electric Company, 4501 St. Clair Avenue, Cleveland, Ohio.

ELWELL-PARKER *Power Industrial* TRUCKS

ESTABLISHED 1893 • BUILDING POWER INDUSTRIAL TRUCKS SINCE 1906

NATIONAL

For Every Steel Requirement

WEIRTON STEEL COMPANY

Pig Iron · Open Hearth Steel · Billets—Slabs · Sheet and Tin Bars · Steel Plates—Tie Plates · Angles, Beams, Channels · Hot Rolled Strip Steel · Cold Rolled Strip Steel · Hot Rolled Sheets · Cold Rolled Sheets · Long Terne Sheets · Galvanized Sheets · Cold reduced Weirite and pack rolled Coke Tin Plate · Charcoal Tin Plate · Copper Bearing Terne Plate · Tin Mill Black Plate · Angle Bars—Rails—Spikes · Bars—Rounds—Squares

GREAT LAKES STEEL CORPORATION

Billets . . . Sheet Bars . . . Forging Bars . . . Merchant Bars . . . Bar Mill Sections . . . Automobile Spring Steel . . . Plates . . . Hot Rolled Strip . . . Cold Rolled Strip . . . Hot Rolled Sheets—to 91" wide . . . Cold Rolled Sheets—to 91" wide . . . Galvanized Sheets . . . High Tensile Sheets . . . High Tensile Bars and Shapes . . . Michigan Metal for Vitreous Enameling . . . Stran Steel Metal Framing

THE HANNA FURNACE CORPORATION

Merchant Pig Iron

Brands: Buffalo · Detroit · Susquehanna

Grades: Foundry · Malleable · Ferro-Silicon · Silvery

STEEL

WEIRTON STEEL COMPANY

WEIRTON, W. VA.

GREAT LAKES STEEL CORPORATION

DETROIT, MICHIGAN

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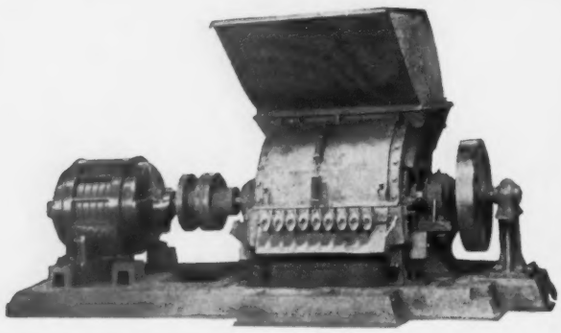
BUFFALO, N. Y. · DETROIT, MICHIGAN

DIVISIONS OF

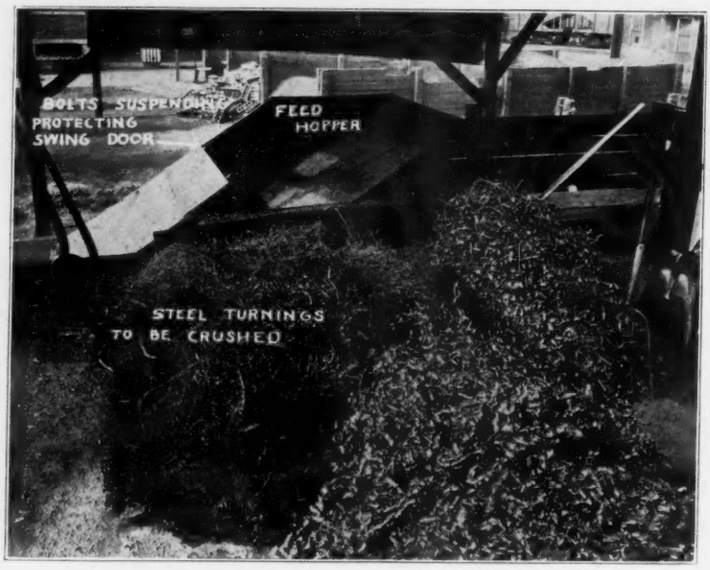
NATIONAL STEEL CORPORATION

PITTSBURGH, PA.

BIG RETURNS
ON A SMALL INVESTMENT



No. 3800 American Steel Turnings Crusher with hopper mounted on bed plate. (Patented)



Feed Platform with Steel Turnings

Many shops and manufacturing plants are making extra profits by crushing their turnings into chips with **AMERICAN RING STEEL TURNING CRUSHERS.** Chips not only bring a higher price but are easier to handle, require less storage space and are easier to ship.

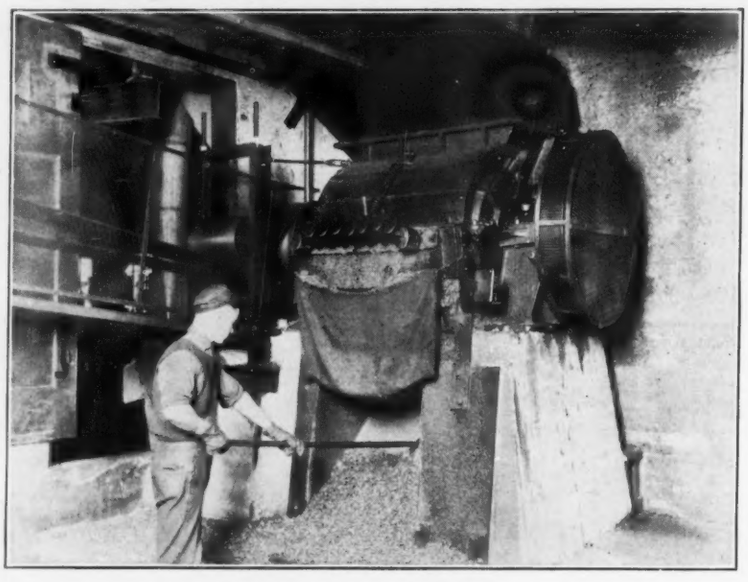
Your long turnings will cease to be a nuisance after you put an **AMERICAN RING CRUSHER** on the job. It will pay for itself in a very short time after which it will pay you a steady profit.

Do you want this **EXTRA** profit?

Write us for full particulars.

American Ring Crushers are crushing run of mine coal to stoker size at maintenance cost as low as 1/10 of a cent a ton.

We manufacture a complete line of reduction equipment. Put your problems up to us.



A Typical Installation

ORIGINATORS OF THE ROLLING RING CRUSHER PRINCIPLE

AMERICAN PULVERIZER CO.

1539 Macklind Ave., St. Louis, Mo.

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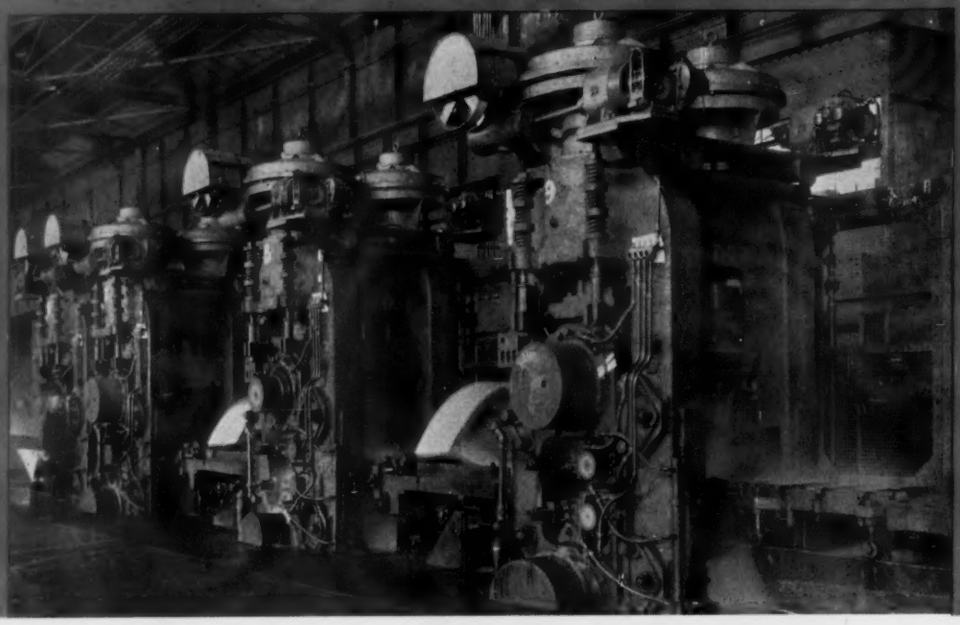
Better DELIVERIES FOR 1939



Hot and Cold Rolled
STRIP and SHEETS *by* SHARON

● A newly inaugurated system in Sharon Steel mills now assures customers of fewer delayed shipments than ever before. Far-reaching into every department, it has facilitated deliveries and promises to become an additional reason for your specification of Sharon Steel's well-known quality strip and sheets.

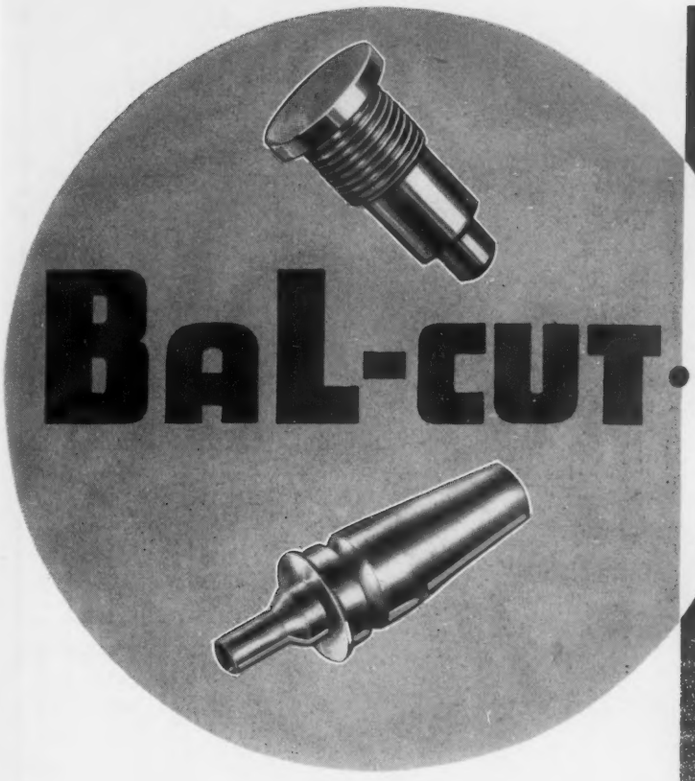
also

COATED SHEETS
AND STRIPS
"GALVANITE"
TERNE . . TIN
HOT GALVANIZED

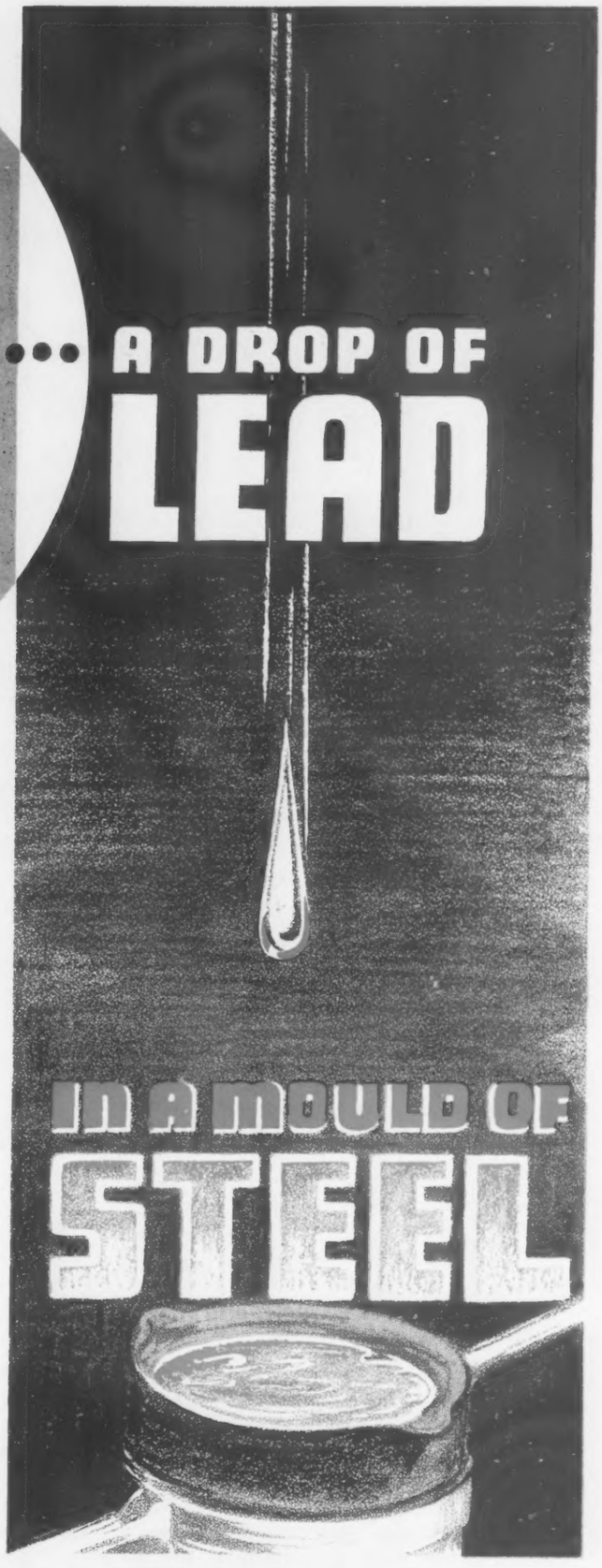
•

STAINLESS AND
SPECIAL ALLOY
STRIP & SHEETS

SHARON STEEL
Corporation
SHARON • PENNA.



BaL-CUT ... A DROP OF LEAD IN A MOULD OF STEEL



LIKE THE LEAVEN in bread or the spirit in wine or the ethyl in gas . . . the Lead in Steel is an accelerant . . . to machinability.

A lead addition of only a fraction of one per cent makes a difference of 30% to 60% in the machinability of steel without sacrifice of other qualities.

The B & L version of this modern steel series is Bal-Cut, now available in both Bessemer and Open Hearth grades, including alloys. In ordering, simply write the word, Bal-Cut ahead of the SAE steel grades you want, and the corresponding leaded steel will be shipped.

Bal-Cut is the aristocrat of leaded steels. It is produced in quality Cold Finished Bars . . . as only B & L mills can make them . . . uniform, accurate and free from blemish.

The master low-carbon open-hearth screw steel type Bal-Cut 1115 is capable of machining up to 300 SFM or more. Its resultant saving in parts-costs often amounts to many dollars per ton of material fabricated into parts.

You have nothing to lose and everything to gain in trying out Bal-Cut on your automatic screw machines. You will find it the real answer to your profit problem in 1939.

B & L engineers are qualified to advise you and to work with you in applying leaded steel to your fabricating requirements.

Ask for B & L Pamphlet on "Leaded Steel"

COLD DRAWN BARS ● GROUND SHAFTING ● LEADED STEELS ● EXTRA WIDE FLATS ● SPECIAL SECTIONS ● ALLOY STEELS

BLISS & LAUGHLIN, INC.

HARVEY, ILL. *Sales Offices in all Principal Cities* BUFFALO, N.Y.

ANY DAY'S A GOOD DAY TO START USING WORTH *sheared* STEEL PLATE

...do it now!

JANUARY						
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8	9	10	11	12	13	14
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TRADE MARK REG. U.S. PAT. OFF.

MOLYBDENUM TUNGSTEN HIGH SPEED STEEL

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THESE LEADING STEEL COMPANIES UNDER THEIR TRADE NAMES

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1. LMW 2. BETHLEHEM H.M. 3. MO-CUT 4. STAR-MAX
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8. TATMO 9. MOTUNG REG. U.S. PAT. OFF. 10. VUL-MO 11. MOHICAN ATLAS STEELS LIMITED WELLAND CANADA

8454

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NITTANY
FREE TURNING BRASS RODS

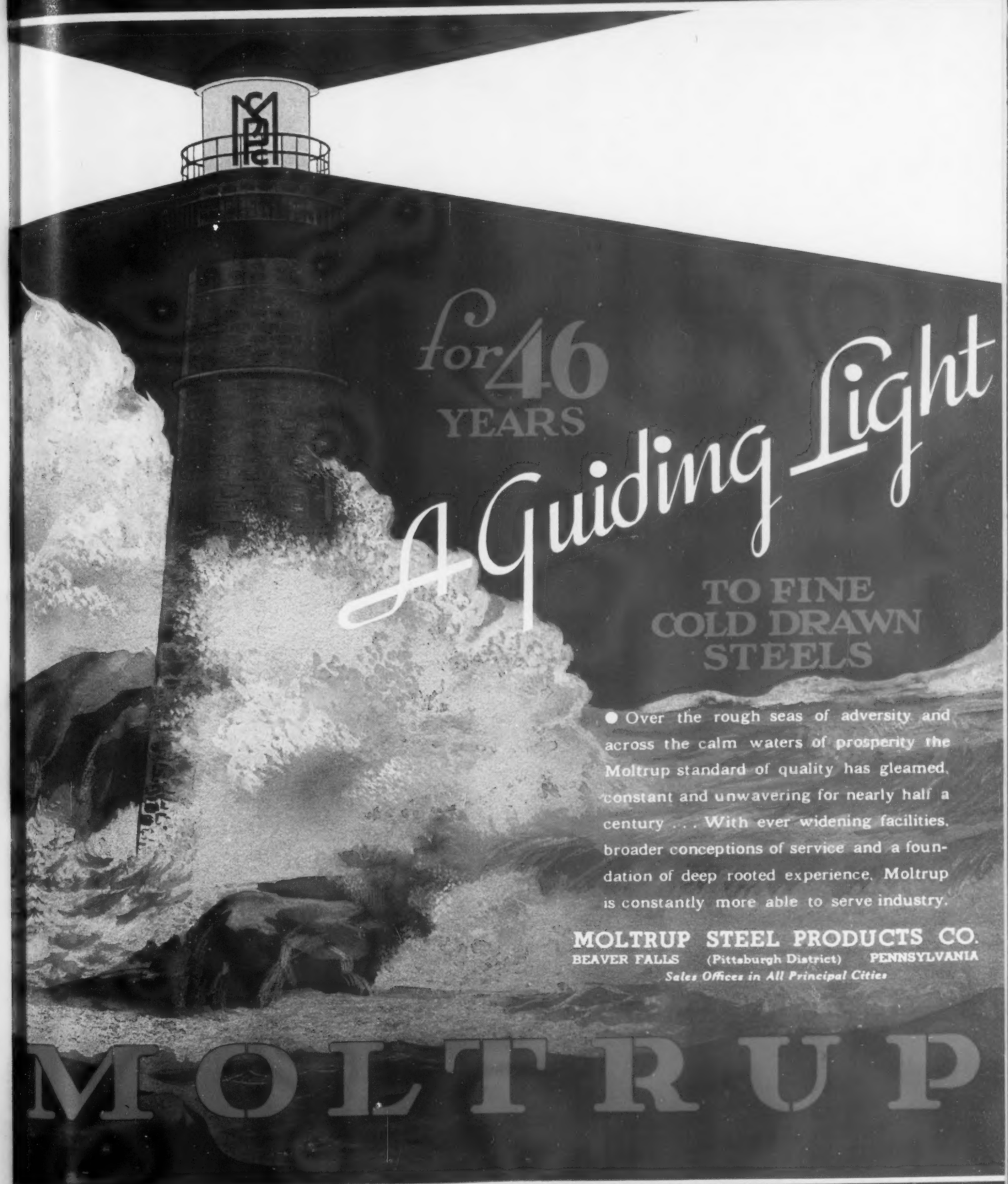
15,000 years ago men stumbled on bronze by melting copper with tin . . . many improvements have been made since that time. Today TITAN BRASS AND BRONZE PRODUCTS might be said to represent the result of 15,000 years of progress.

It is difficult to conceive of a world that lacks shipbuilding, automobiles, trains, airships, refrigerators, air conditioning equipment, oil refineries, musical instruments, plumbing fixtures, vacuum cleaners, washing machines, mining equipment, and a host of similar contributions to civilization. Yet, without brass and bronze products, many of these contributions would be in their infancy.

The TITAN METAL MANUFACTURING COMPANY is devoted exclusively toward the improvement, manufacture and distribution of brass and bronze products. TITAN products are well known to many manufacturers, because when brass or bronze forgings are specified, they think of TITAN. If TITAN makes it, the user knows that it will resist chemical corrosion and the wearing effect of shock loads. In an area bounded by Hartford, Detroit, Rochester and Richmond live 40,000,000 people. Bellefonte, Pa., is the center of this area, and it is in Bellefonte that the TITAN mills are located. Ideally placed to serve many, TITAN brass and bronze products have built up an enviable reputation. Special requirements and special schedules are but two examples of flexible service. Before you place your next order, let TITAN quote you prices.

TITAN

Metal Manufacturing Company
BELLEFONTE, PENNSYLVANIA


for 46 YEARS
A Guiding Light
TO FINE COLD DRAWN STEELS
● Over the rough seas of adversity and across the calm waters of prosperity the Moltrup standard of quality has gleamed, constant and unwavering for nearly half a century . . . With ever widening facilities, broader conceptions of service and a foundation of deep rooted experience, Moltrup is constantly more able to serve industry.
MOLTRUP STEEL PRODUCTS CO.
BEAVER FALLS (Pittsburgh District) PENNSYLVANIA
Sales Offices in All Principal Cities
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STEEL WITH CHARACTER

You can get the best results from steel which has qualities exactly suited to your needs. It must have the right characteristics today—tomorrow—and *every* day. • Flat rolled steel products produced in the new modern mills of the Granite City Steel Company have true character, because they measure up to your standards faithfully. These dependable results are the reward of the unusual metallurgical skill and careful, personalized production methods found at Granite City Steel Company. • If you use any of these steel products, it will pay you to get in touch with our nearest office.

STRIPLATES · GALVANIZED SHEETS · BLACK SHEETS
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GRANITE CITY STEEL COMPANY

SINCE GRANITE CITY STEEL 1878

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1602 Mariner Tower, Milwaukee • 1613 Pioneer Building, St. Paul • 4000 York Street, Denver • 77 McCall Place, Memphis

ON TIME!

. . . perhaps the most consoling words in the industrial field. Words that, next to *quality*, emphasize production results; that tally the score on the ledger sheets and that retain customer relationships over greater lengths of time.

The customers of Beals, McCarthy and Rogers have evaluated our QUALITY and SERVICE motifs for a full one hundred and thirteen continuous years. Their requisites in steel, industrial and nonferrous supplies have been faithfully filled and delivered ON TIME by the mode of transportation best suited. A centralized distribution point with well stocked warehouses has done much toward this contribution.

Permit us to mail you a copy of our Stock List No. 113. Its completeness will save you much time in the selection of the materials you need.

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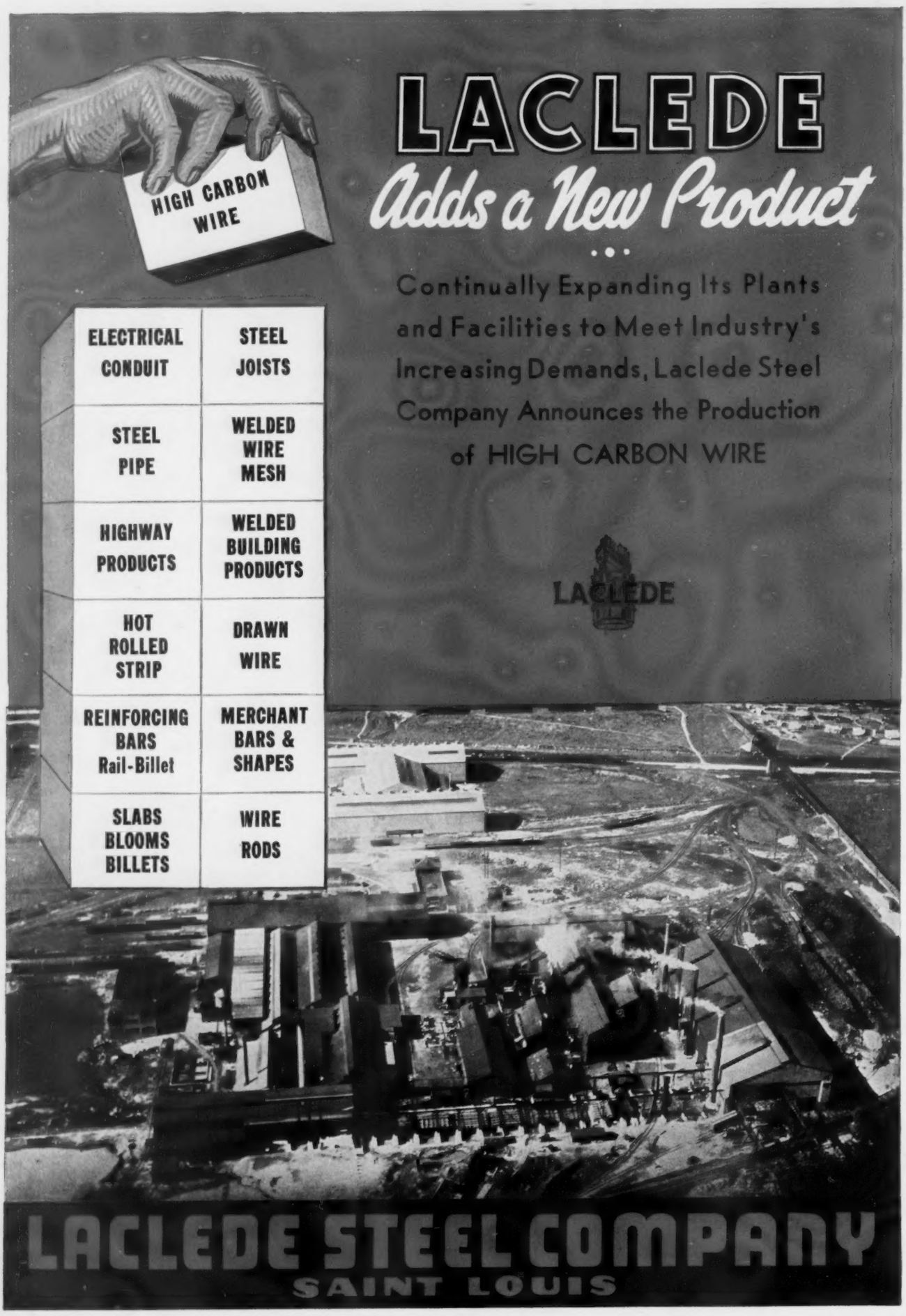
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Adds a New Product
Continually Expanding Its Plants and Facilities to Meet Industry's Increasing Demands, Laclede Steel Company Announces the Production of HIGH CARBON WIRE
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ELECTRICAL CONDUIT
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DRAWN WIRE
REINFORCING BARS Rail-Billet
MERCHANT BARS & SHAPES
SLABS BLOOMS BILLETS
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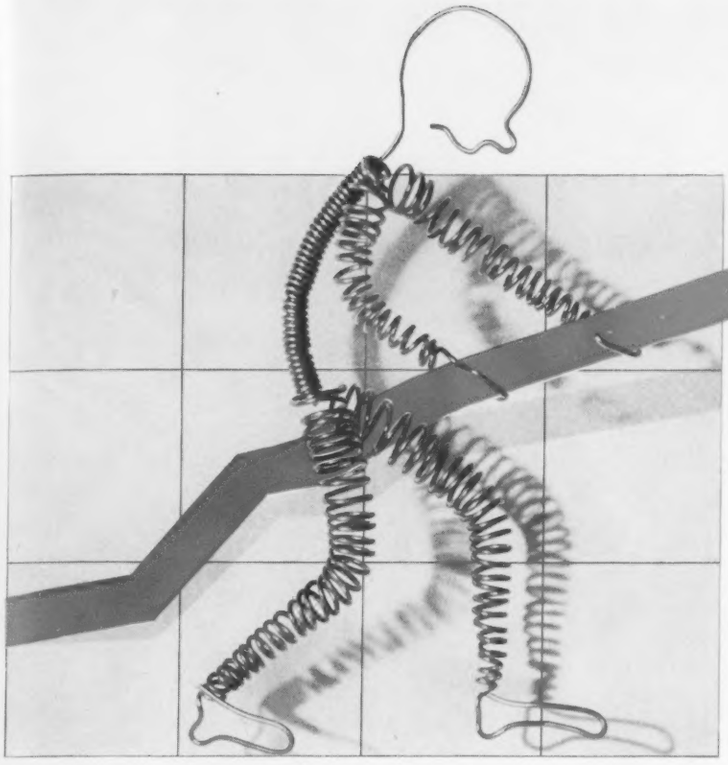

Wire that Pulls up Production

Takes the sag out of output curves . . . because it processes rapidly and smoothly, cuts down rejections and waste. Possibly one of the many Keystone wires regularly stocked will fit your requirements perfectly. If not, Keystone's technical staff will create a wire that does . . . and produce it for you with unfailing uniformity. We like to talk wire . . . we believe we have something to offer you.

Low and High Carbon Round Wires in following finishes:

Brite
Brite Annealed
Black Annealed
Galvanized
Galvannealed
Copper Coated
Liquor Finished
Tinned

Cold Heading Wires
Stapling Wire
Broom Wire
Mattress Wire
Samson Spring Wire
Rope Wire
Fine and Weaving Wire
Welded WIRE Hoops
WIRE NAILS
WIRE RODS
Steel Billets

Wire in Coils or straightened and cut to length

KEYSTONE
STEEL & WIRE CO., Dept. S, Peoria, Illinois

SAMSON SPRING WIRE
REG. U.S. PAT. OFF.
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

MIDVALE

AT THE START of a new twelve months, at a time when conditions show more promise of adequate return to those eager to work, Midvale wishes to thank its many friends for the business they have given us, to promise that the work done for them in the next twelve months will have our most careful and prompt attention, and to wish that each and every one of them has a successful 1939.

THE MIDVALE COMPANY
NICETOWN, PHILADELPHIA, PA.

OFFICES: *New York • Chicago • Pittsburgh • Washington • Cleveland • San Francisco*

Step Up..

YOUR AUTOMATIC SCREW MACHINE PRODUCTION WITH-

WYCKOFF LEADED STEELS

The New Cold Drawn Steels That Guarantee More Pieces Per Hour and More Hours Per Grind!

Production records conclusively prove that Wyckoff Leaded Steels will machine better and at much higher speeds than any of the well known standard screw stocks.

If you are interested in securing maximum machinability, make a test of Wyckoff Leaded Steel on some of your operations and you will quickly recognize the profitable possibilities and desirability of adopting this new cold drawn steel for your requirements. It is available in either Open Hearth or Bessemer Steel to meet your individual preference.

Data covering the characteristics and performance of these new Wyckoff Leaded Steels will be sent upon request.

WYCKOFF DRAWN STEEL COMPANY

FIRST NATIONAL BANK BLDG.
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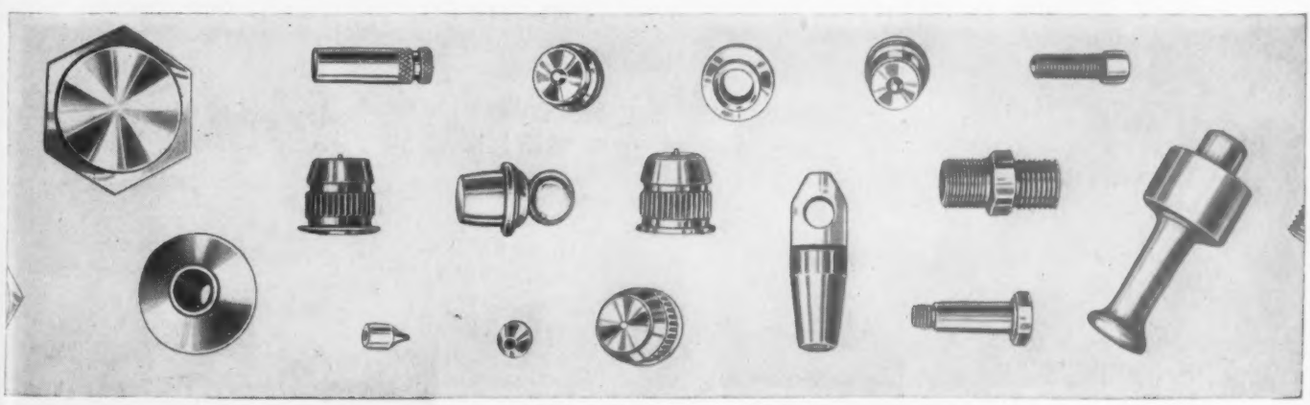
3200 SO. KEDZIE AVE.
CHICAGO, ILL.

MILLS AT AMBRIDGE, PA. AND CHICAGO, ILL.—WAREHOUSE STOCKS IN PRINCIPAL CITIES



O. H. REFINEMENT PLUS SPEED

Monarch's three fast cutting, non-alloy steels embody all the refinements of an open hearth composition in its highest quality form and a metallurgical contribution that provides for greater and faster machinability in both standard and special shapes.

SPEED CASE X-1515 . . .

Users of this extra free machining .15 to .20 carbon case hardening steel report increases in production up to more than 50% as compared with the best SAE carburizing steels. SPEED CASE X-1515 is the fastest machining open hearth steel with good physical properties obtainable. It is, furthermore, extremely ductile, permitting severe cold forming operations without fracture. In the case hardened state it has more than 50% greater resistance to impact than standard carburizing grades such as X-1314 or SAE 1015.

SPEED TREAT X-1535 . . .

SPEED TREAT X-1535 is in the .30 to .40 carbon range and produces a tensile strength of over 100,000 lbs. in cold drawn, yet it will machine at about the same speed as SAE 1112 Bessemer. We recommend X-1535 wherever a good tough steel is required in combination with free machining, such as in the production of electric motor shafts.

SPEED TREAT X-1545 . . .

This grade answers all the requirements of a steel like SAE 1045, yet it is in a class by itself as far as free machining is concerned for a .40 to .50 carbon steel. SPEED TREAT X-1545 enables the manufacturer to produce parts with 110,000 lbs. tensile faster than with any other open hearth steel, regardless of carbon content or tensile strength.

May we mail you complete particulars on any one or all three grades of steel listed?

ROUNDS • SQUARES
HEXAGONS • FLATS
SPECIAL SHAPES

Sole Licensee for Eastern States

THE FITZSIMONS COMPANY

YOUNGSTOWN, OHIO

manufacturers of

COLD DRAWN STEEL BARS

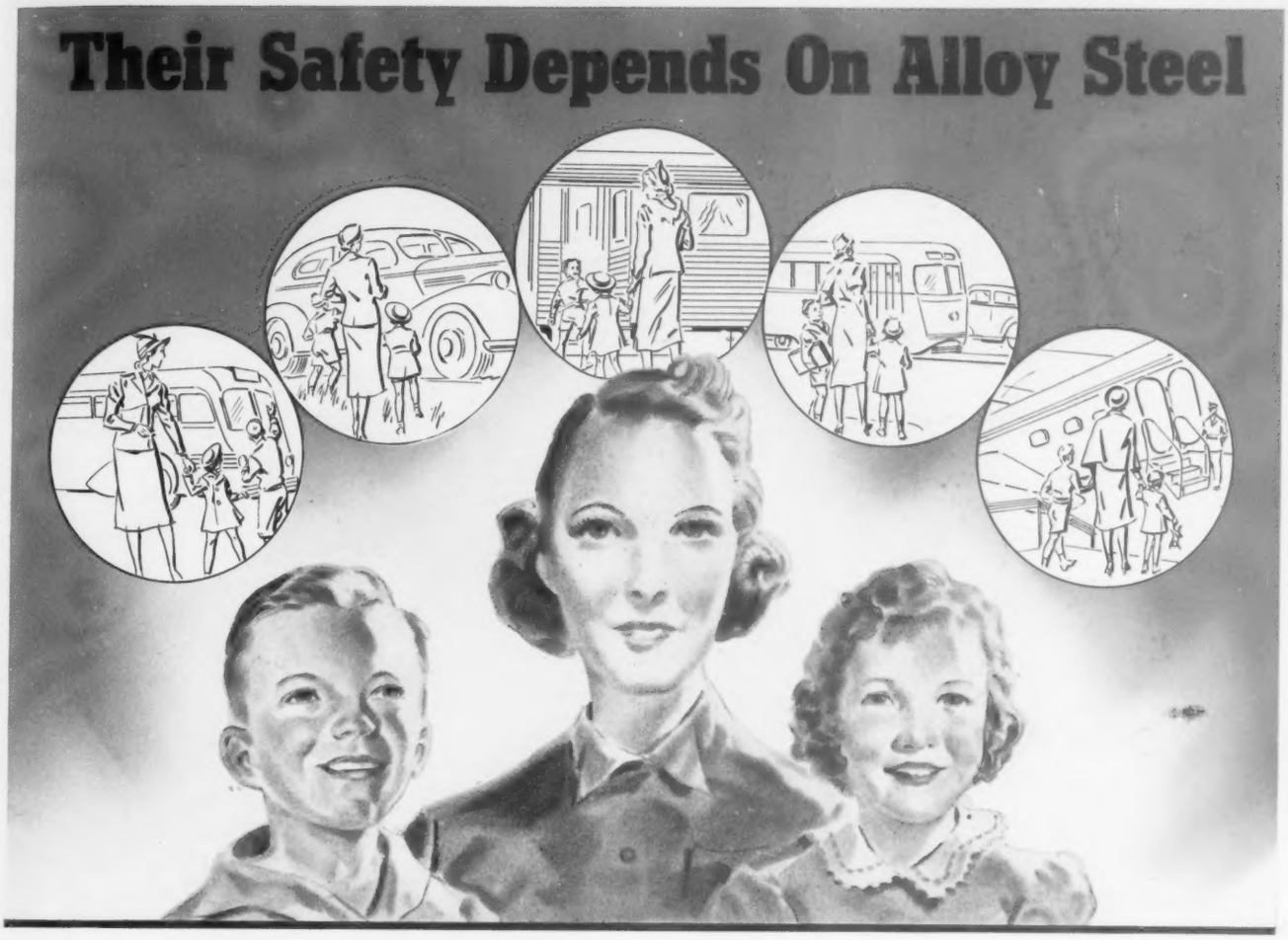
Carbon and Alloy Steels to all S.A.E. Analyses

Licensor

MONARCH STEEL COMPANY

INDIANAPOLIS, IND • CHICAGO • HAMMOND, IND.

Their Safety Depends On Alloy Steel



The dependability and safety of modern American passenger transportation—in private automobiles, airplanes, buses and trains—are a tribute to American steel.

American steel manufacturers have progressed far beyond old world traditions in the application of scientific methods to steel research, production and quality control. The manufacture of TIMKEN Alloy Steel is a typical example.

When The Timken Roller Bearing Company became a steel manufacturer in order to raise and maintain the quality standard of TIMKEN Bearings it was not hampered by precedent. We were interested only in results. Thus many of the research, production and control practices in use in our steel plant are original with us. That they are effective is proved by the outstanding performance of TIMKEN Steel and TIMKEN Seamless Steel Tubing wherever they are used.

GOOD WILL BASED ON GOOD STEEL

Alloy Blooms, Billets and Bars

Carbon and Alloy Seamless Tubing

Tool and Fine Steels

Stainless Steels

Open Hearth and Electric Furnace Quality

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

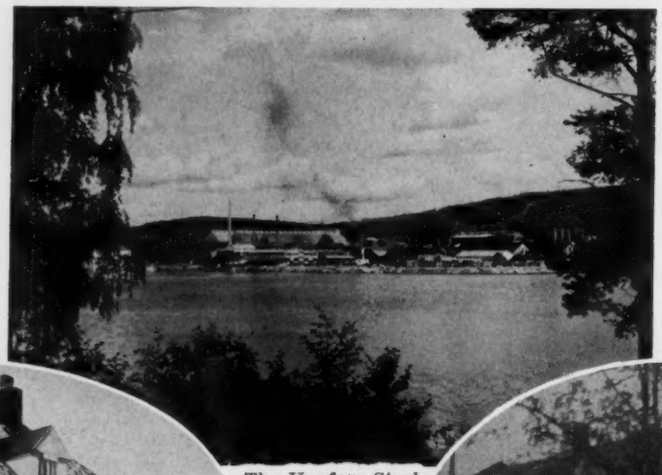
TIMKEN
ALLOY STEELS

UDDEHOLM

Est. UHB 1668

» One Organization from Mine to Finished Bar «

PROGRESS BUILT ON TRADITION



The Hagfors Steel Mills

Research Laboratory at Hagfors

Research Laboratory at Munkfors

MILLS: 4 modern mills (115,000 tons capacity)
ORES: 5 of Sweden's best iron ore mines
FUEL: Charcoal from Its 700,000 Acre Forests

POWER: 110,000 HP own hydro-electric
OWN RAILROAD
OWN STEAMSHIPS

TOOL STEELS

UHB Carbon Steel

UHB-46 Oil Hardening Steel

ARNE Air Hardening Steel

Carbon Steel

UHB REGIN All Purpose Tool Steel

UHB VALAND Heavy Duty Hot Work Steel

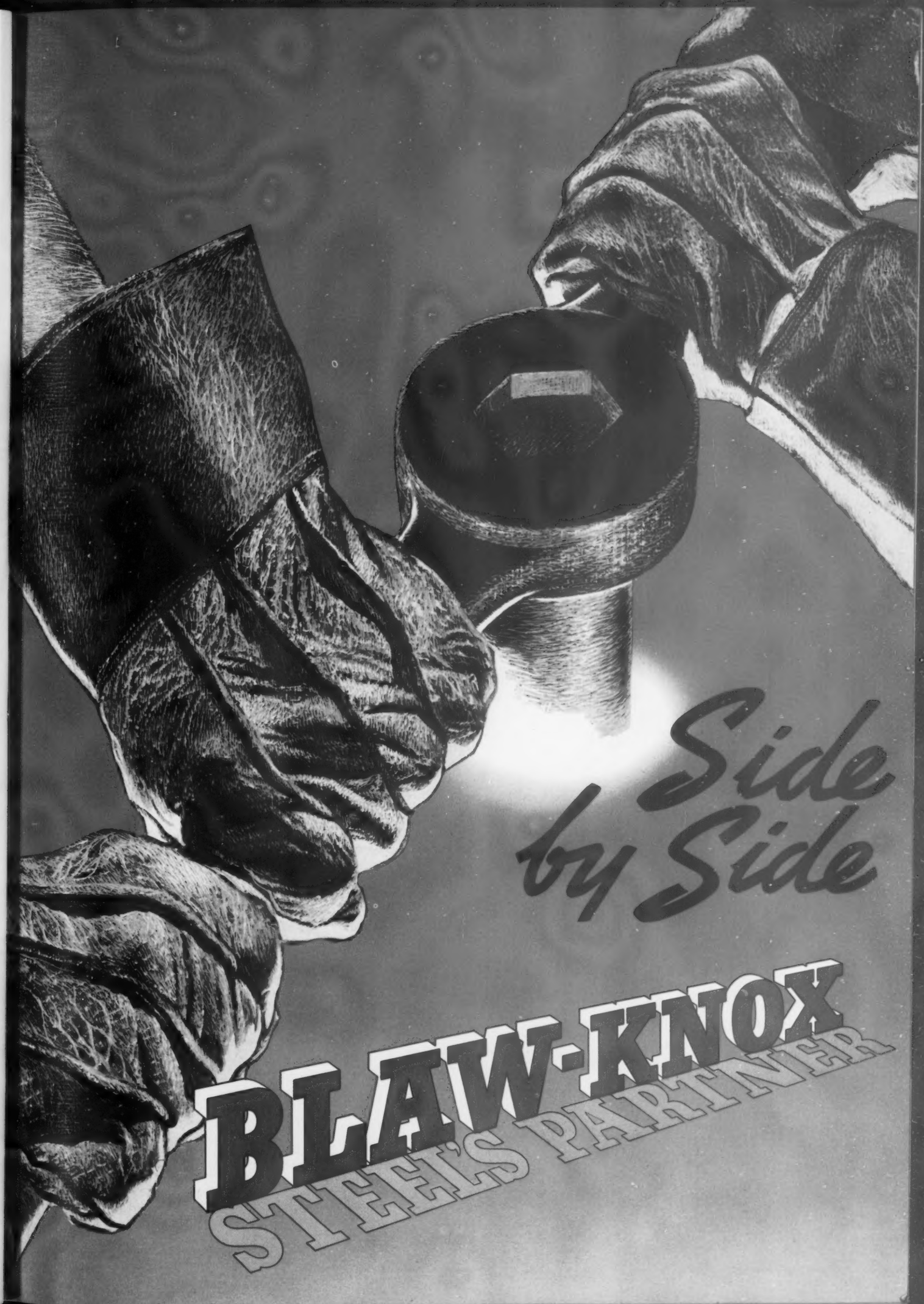
14 CENTRAL STOCKS

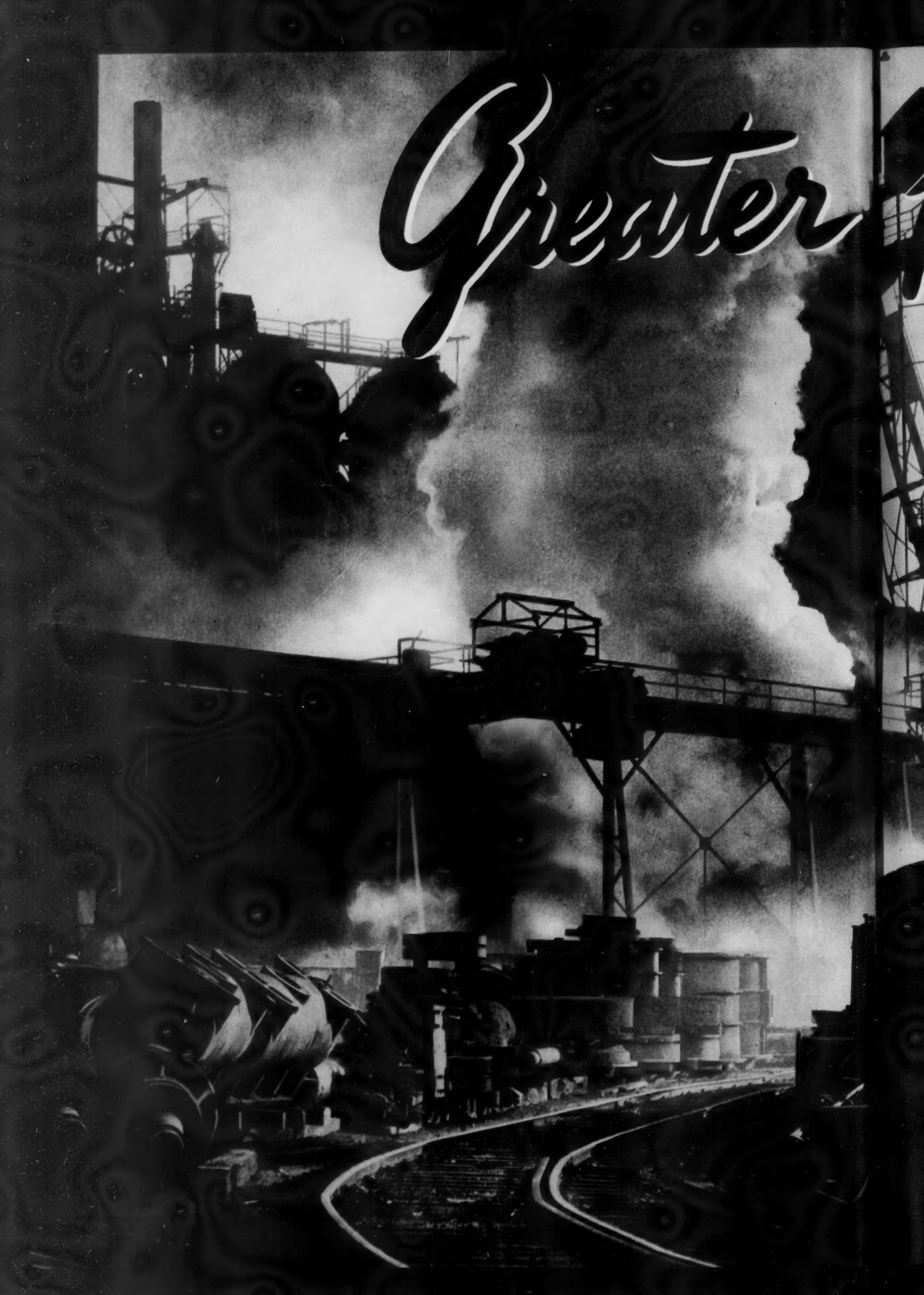
ATTLEBORO, MASS., ACKERLIND STEEL COMPANY, INC.
CAMBRIDGE, MASS., AUSTIN-HASTINGS COMPANY, INC.
CHICAGO, ILL., UDDEHOLM COMPANY OF AMERICA, INC.
CLEVELAND, OHIO, THE PENINSULAR STEEL COMPANY
DAYTON, OHIO, THE PENINSULAR STEEL COMPANY
DETROIT, MICH., THE PENINSULAR STEEL COMPANY
GRAND RAPIDS, MICH., THE PENINSULAR STEEL COMPANY
LOS ANGELES, CAL., JAMISON STEEL CORP.
NEW YORK, N. Y., ACKERLIND STEEL COMPANY, INC.
PHILADELPHIA, PA., L. NORRIS HALL, INC.
PROVIDENCE, R. I., ACKERLIND STEEL COMPANY, INC.
SAN FRANCISCO, CAL., JAMISON STEEL CORP.
TOLEDO, OHIO, THE PENINSULAR STEEL COMPANY
WORCESTER, MASS., AUSTIN-HASTINGS CO., INC.

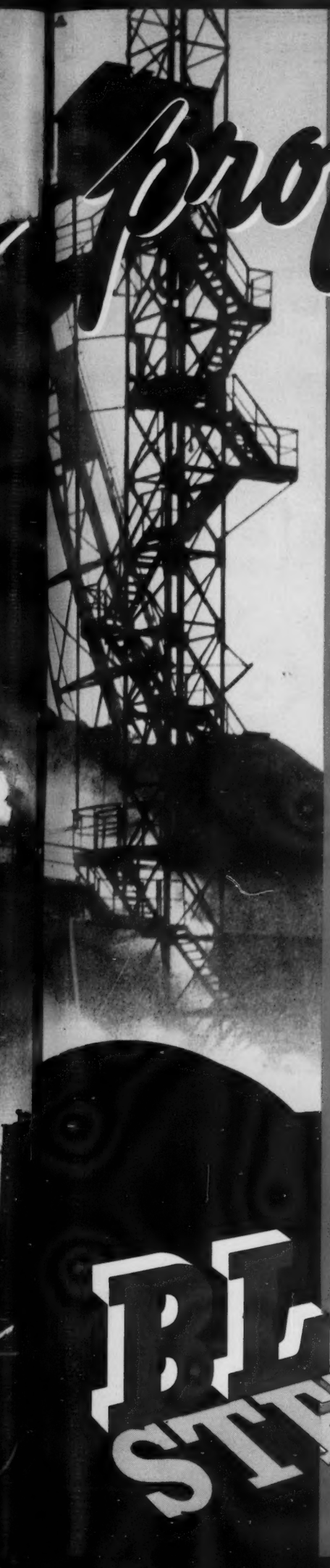
UDDEHOLM COMPANY of AMERICA inc.

155 East 44th St., New York, N. Y.

4532 West Palmer St., Chicago, Ill.


Side by Side
BLAW-KNOX
STEEL'S PARTNER


Greater



Profits for 1939

Before Blaw-Knox—Steel's Partner—is the self imposed assignment of helping Steel make greater profits in 1939. All the research facilities, all the experience, all the inventiveness, all the technological and marketing knowledge of the nine divisions comprising Blaw-Knox are bent to this task.

Some amazing things have come out of Blaw-Knox group-thinking: ways to modernize plant operation, to use steel in many basic products that hitherto used other materials, to develop finishes for new purposes, to broaden present and create new markets, to make plant operation so flexible that profits are possible even on low-production schedules.

These are just some of a great number of high-roads to profit during 1939 that Blaw-Knox will be glad to discuss with any steel operator.

BLAW-KNOX COMPANY

FARMERS BANK BUILDING, PITTSBURGH, PA.

NEW YORK • PHILADELPHIA • CHICAGO
BIRMINGHAM • LONDON • PARIS

THE NINE DIVISIONS OF BLAW-KNOX COMPANY AT YOUR SERVICE

Blaw-Knox Division • Lewis Foundry and Machine • National Alloy Steel • Pittsburgh Rolls • Union Steel Castings • Power Piping Division • Blaw-Knox Sprinkler Division • Gordon Lubricators • Electrochemical Processes Division

BLAW-KNOX
STEEL'S PARTNER

BLAW-KNOX
NINEFOLD
Service to Steel

Partial List of Products

BLAW-KNOX DIVISION,
Blawnox, Pa.

Equipment for plants operating steel, glass copper and other high temperature furnaces including water-cooled doors and frames, ports, valves, dampers, skewbacks, slag line coolers, bulkhead coolers, burner coolers, mantel coolers, buckstays, dolomite machines, door hoists, annealing boxes, covers and pots, galvanizing kettles, welded ladles, soaking pit covers, tin pots, spelter pans, grease kettles, hot blast valves, etc. Clamshell buckets; steel grating and treads; standard buildings; steam purifiers; gas cleaners, etc.

LEWIS FOUNDRY & MACHINE,
Pittsburgh, Pa.

Chilled iron and iron alloy rolls for iron, steel, brass, copper, aluminum, zinc and nickel, hot sheets, cold sheets, tin plate and strip, merchant bars and rods, special machinery for the rolling mill industry.

Mill drives, three high mills, continuous bar and billet mills, cold mills for sheet and strip, shape straightener machines, motor operated screwdown for mills, gear sets, plate levelers, rail breakers, rail re-rolling mills, universal mill spindles, shears of all varieties, testing machines, etc.

ELECTROCHEMICAL PROCESSES DIVISION, Pittsburgh, Pa.

Complete continuous units for cleaning, pickling, finishing, rust proofing, coloring, plating of tin, terne, copper, zinc, brass, bronze, lead, nickel, and iron alloys.

NATIONAL ALLOY STEEL,
Blawnox, Pa.

Alloy steel castings—heat, abrasion and corrosion resisting, including shafts for normalizing furnaces, conveyor parts, dampers, valves—for use under severe conditions of service.

PITTSBURGH ROLLS,
Pittsburgh, Pa.

PHOENIX ROLLS: Phoenix steel for unusual strength, Phoenix "A" (steel alloy) for strength and wear; Phoenix metal—Phoenix "K" for strength, wear, and finish. Phoenixloy (uniformly hard) for flat rolling where high finish of extremely thin gage of material is required to be free from all marks and defects; Phoenix Chill—Phoenix nickel chill for all flat rolling requiring finish. Tube mill rolls of quality material best suited to the kind of service required.

UNION STEEL CASTINGS,
Pittsburgh, Pa.

Spindles, coupling boxes and other steel mill castings of UNIVAN "C" to insure great strength and exceptional wearing qualities. Charging boxes made of tough UNIVAN alloy have longer life because of unusually high impact value.

POWER PIPING DIVISION,
Pittsburgh, Pa.

Power piping systems completely engineered, fabricated and erected. High temperature and high pressure piping.

BLAW-KNOX SPRINKLER DIVISION, Pittsburgh, Pa.

Automatic sprinkler systems guaranteed to meet all insurance requirements.

GORDON LUBRICATORS,
Pittsburgh, Pa.

Grease lubricating systems for heavy machinery. Automatic and mechanical control.

BLAW-KNOX
STEEL'S PARTNER

Lighter by More Than A Ton...Costs No More

Truck body—204" long x 92" wide x 103" high. Built of DYN-EL by H. Kaiser & Co., Inc., Philadelphia, for Philadelphia Rapid Transit Company. Largest Public Utility truck in one single unit ever constructed. Built to carry 30-foot steel trolley poles. Contains mechanism for lifting poles into body shelves as well as a pole derrick for erecting them.

The Philadelphia Rapid Transit Company eliminated more than a ton of dead weight—cut gas, tire and license costs—by building their new large-capacity truck light and strong with Dyn-el, Alan Wood's new high tensile steel. A conventional body of this type weighs 7,200 pounds. Using Dyn-el for bulk heads, gussets, super-structure and base, the road weight of the new truck is 4,235 pounds . . . A saving of 2,965 pounds. Yet, the body of Dyn-el costs no more. Dyn-el is 50% stronger than ordinary sheet steel . . . 60 to 150% more resistant to corrosion than copper-bearing steel (4 to 6 times ordinary steel). The body is 9 inches longer than the same size unit built in wood and contains 47% more cubical material and tool carrying space.

The 48-page book, "A. W." Presents Dyn-el, gives full details of savings in weight and cost possible with this new high-strength, flat-rolled steel. Diagrams, tables and charts cover a wide range of tests and properties. To executives, this book gives a quick picture of performance and costs. To engineers, it gives a complete fabricating and design properties and table of sizes and weights. We will be pleased to send you a copy.

DYN-EL

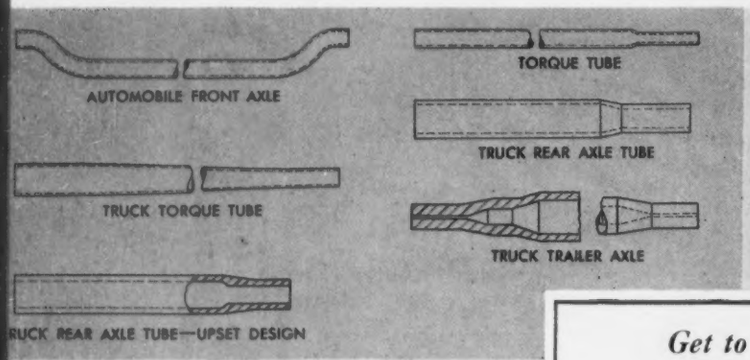
ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS, CONSHOHOCKEN, PENNA. : : SINCE 1826 : : DISTRICT OFFICES AND REPRESENTATIVES—Philadelphia, New York, Boston, Detroit, Los Angeles, Seattle, San Francisco, Houston, Roanoke, Buffalo, Pittsburgh, Cleveland, Chicago, Cincinnati, New Orleans, St. Paul, St. Louis, Montreal. PRODUCTS INCLUDE—"A. W." Rolled Steel Floor Plate : : "Swede" Pig Iron : : Billets—Blooms and Slabs : : Sheared Steel Plates : : Hot Rolled Sheets and Strip : : Steel Products also furnished in Copper and Alloy analyses.

INDUSTRY ASSIGNS

IN REFINERIES, COMPRESSOR STATIONS, ETC., piping must be strong to withstand high pressure, and ductile to permit bending with no sacrifice in wall strength. That's why NATIONAL Seamless is first choice for piping in applications like this Texas compressor station. To refineries, NATIONAL offers the most complete available line of still tubes—24 different analyses.

THE OIL INDUSTRY is a large user of NATIONAL Seamless because it needs the strongest, toughest materials available. These men are stabbing in a section of NATIONAL Seamless Drill Pipe, the type that has enabled drillers to break many records for deep drilling. NATIONAL Seamless Casing and Tubing are also favorites with oil men because of their rugged strength and dependability.



AUTOMOBILE PARTS are of vital importance, because on their performance depends the performance of the entire car. That's why many manufacturers insist on Shelby Seamless Tubing parts like these. In machine parts, too, this precision tubing makes possible fine workmanship because it machines so readily.

IN AIRCRAFT CONSTRUCTION, strength-weight ratio takes precedence over all other properties. That's why Shelby Seamless Aircraft Tubing, a product of National Tube, is a favorite with aeronautical engineers. This new basic training plane, without the fuselage covering, illustrates the extensive use of Shelby.

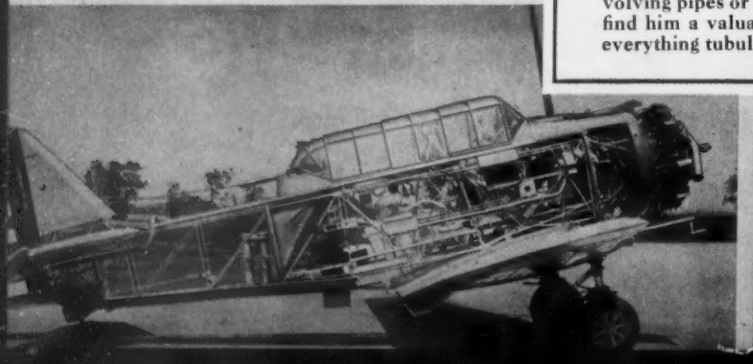
SAFE GAS MAINS. NATIONAL Seamless was selected for lines to replace mains washed out by the floods which occurred in Southern California last spring. This pipe bridge, also of NATIONAL, was constructed to carry two NATIONAL Seamless mains respectively 6 and 8 inches O.D., across Monrovia Canyon.

WATER MAINS operated at high pressures require NATIONAL Seamless for safe, dependable service. This NATIONAL pipe line serves a large city in the west. It is here that NATIONAL Seamless proves its ability to withstand vibrations, pressure surges, and even possible ground settlement and sudden shocks.

Get to Know the Man From

NATIONAL TUBE

The man from National Tube offers you valuable engineering service, based on a vast store of practical experience. His job is to give you worthwhile assistance in solving any problem involving pipes or tubes. You will find him a valuable contact for everything tubular.



ITS *Toughest Tubing Jobs* TO SEAMLESS

NATIONAL SEAMLESS means pierced from solid billets of the finest quality steel. Only sound and flawless steel can be used for piercing, since no defects can be covered up in this process. A thorough system of inspection and tests at every stage in production gives you double assurance that each length of NATIONAL Seamless will display the same uniform wall strength, dimensional accuracy, and uniformity in all physical properties.

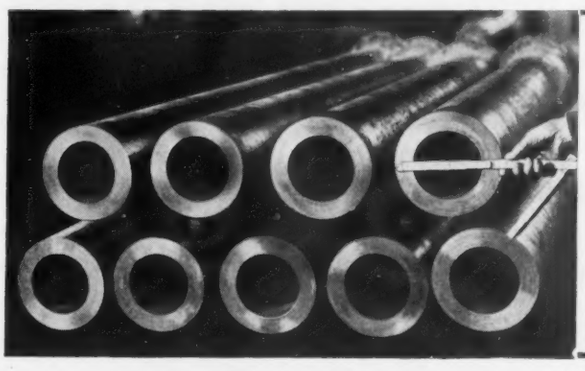
EVERY day brings in more proof that NATIONAL Seamless is the closest approach to the perfect tube. Pipe lines withstand higher pressures; oil well drillers bore deeper into the earth; steam boilers are safer; vital machine parts are stronger, longer lasting.

Producing the finest possible pipe and tubes is the job to which National Tube assigned itself many years ago. Before much time had elapsed, it became evident that seamless was destined to outstrip all other types of tubular products. By constant research and development, National Tube steadily improved manufacturing technique, effected ingenious advances that have made seamless America's preferred pipe.

The net result of this achievement is that NATIONAL Tube offers to all industry a complete line of seamless pipe and tubes of unvarying high wall strength, thoroughly uniform both in dimensions and in physical properties.

Today, industrial men are entrusting their toughest jobs to NATIONAL Seamless. In almost any industry you can name, seamless has been the instrument by which difficult problems have been solved.

Whenever you need a pipe or tube that has an extra margin of safety, pipe that must not fail, you can safely entrust the job to NATIONAL Seamless "Walls Without Welds." It is available in sizes ranging from 3/16-inch mechanical tubing to 24-inch O.D. pipe.



HIGH-PRESSURE STEAM. This extra-heavy NATIONAL Seamless is ready for installation in an industrial power plant operating at 840 pounds pressure. This pipe measures 7⅝ inches O.D., 1.31 inches thick. Ten-inch Vanstone flanges were turned on the pipe in a single heat, machined to a mirror finish, and made up without gaskets.

FOR STEAM BOILERS, stationary, locomotive, or marine, there are no finer, safer tubes than NATIONAL Seamless. They are easy to bead, roll, and head into flue sheets, and having no weld, there is no line of potential weakness. 25 recently built Hudson-type locomotives of New York Central are equipped with NATIONAL Seamless Boiler Tubes.

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

★

ANNOUNCING...

R. D. WOOD COMPANY'S

INVERSE FLOW SHIELDED SEAT PRINCIPLE

INCORPORATING V-NOTCH SHOCK CONTROL

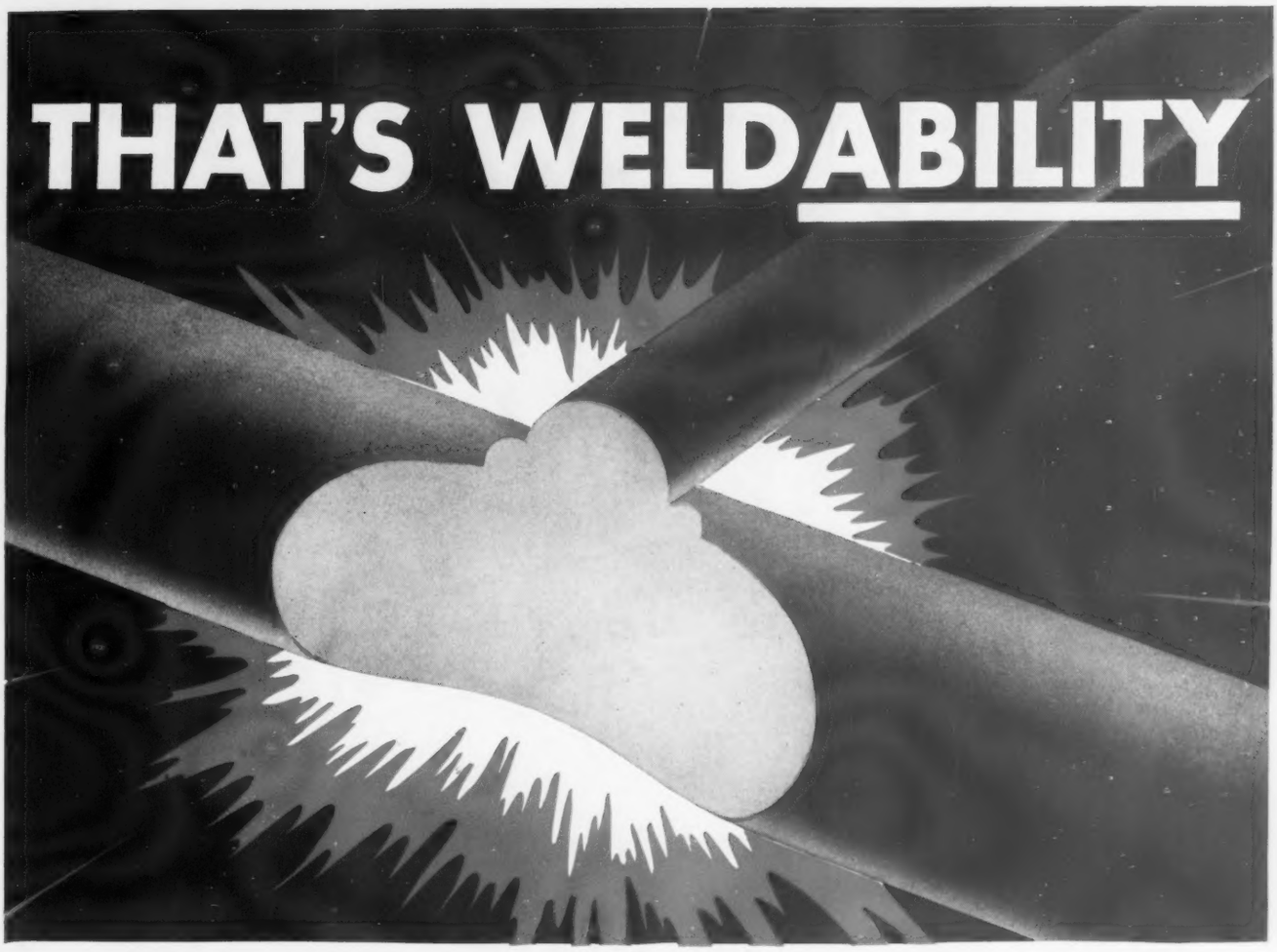
An important NEW development in Hydraulic Valves...for Spray Control (descaling systems) and all other industrial applications.

We will gladly supply full details on
these NEW Hydraulic Valves designed to improve operation,
lower maintenance and reduce shut-down expense.

ESTABLISHED 1803 **R. D. WOOD CO.** PHILADELPHIA, PA.

HYDRAULIC PRESSES and VALVES for EVERY PURPOSE

THAT'S WELDABILITY



24
One in a series of advertisements designed to help you make a better selection of wire for maximum value per unit of cost.

Wires that just casually stick together cannot claim true weldability. When wires are of such a nature that when properly heated and subjected to correct pressure they will fuse into a homogeneous mass . . . that's weldability.

Assembling wire forms by welding has become so general that in considering the necessary characteristics of a wire for a specific use, weldability must often be included.

Clean surface, proper chemical composition and uniformity are the requisites in wire that result in a satisfactory product after welding. Other requirements of the product may demand further definite characteristics such as strength, stiffness, or hardness.

Wickwire Spencer engineers have kept pace with the development of welding technique and are producing Wissco Wires that meet every requirement of forming and product use, yet possess the additional characteristic . . . weldability. Let them suggest a wire. It may reduce your production cost and make a better product.

WICKWIRE SPENCER STEEL COMPANY

New York City, Buffalo, Chicago, Detroit, Worcester. Pacific Coast Headquarters: San Francisco. Warehouses: Los Angeles, Seattle, Portland. Export Sales Dept.: New York

Wickwire Spencer manufactures High and Low Carbon Wires—in various tempers, grades and finishes—for your specific purpose. Hard-Drawn, soft or annealed Basic or Bessemer Wires—Hard-Drawn annealed, or oil-tempered Spring Wire, Chrome Vanadium Spring Wire—Valve Spring—Music—Clip—Pin—Hairpin—Hook and Eye—Broom—Stapling—Bookbinding—Dent Spacer Wire—Reed Wire—Clock—Pinion—Needle-Bar—Screw Stock—Armature Binding—Brush—Card—Florist—Mattress—Shaped—Rope—Welding. Flat Wire and Strip Steel, High or Low Carbon—Hard, annealed or tempered—Clock Spring Steel—Corrosion and Heat Resisting Wires. Consult the Wissco technical man on your wire problems, however large or small.

WISSCO WIRE
by Wickwire Spencer

Happy New Year

★ ★ ★

To our readers,

To our advertisers

. . . to all our friends

We extend Greetings

and sincere Good Wishes

For success and greater

prosperity in 1939.

THE ENTIRE STAFF OF

STEEL

UNBRAKO

SELF-LOCKING HOLLOW SET SCREW
WITH THE KNURLED POINT

CAN'T VIBRATE LOOSE
PREVENTS BREAKDOWNS
AVERTS ACCIDENTS

You can now be sure that every set screw will permanently perform its intended duty. No longer do you need to wonder and worry whether vibration will cause them to loosen. Equip your machines with the new *"Unbrako" Self-Locking Knurled Set Screws.* Ingenious knurling on the cup points automatically and so surely locks them in place, when tightened in the normal manner, that no amount of shaking, jarring or vibration will loosen them. Maintenance men can entirely neglect them without cause for alarm. Yet, these screws can be easily removed for adjustment if desired and re-used again and again, indefinitely. Tests made in innumerable mills and under all conditions prove these facts. Write us today. Ask for samples, prices and complete details.

Fig. 1641 Pat. App. for

Fig. 1646 Pat. App. for

KNURLED POINT
UNBRAKO
SELF-LOCKING
Square Head
SET SCREW

Here's another new "Unbrako" product with countless uses. *"Unbrako" Self-Locking Square Head Set Screw.* These also have the knurled points so they stay-put despite the most severe vibration. Can be adjusted as often as required without affecting the locking efficiency. Write for details.

STANDARD PRESSED STEEL CO.

BRANCHES
BOSTON
DETROIT
INDIANAPOLIS

JENKINTOWN, PENNA.
BOX 579

BRANCHES
CHICAGO
ST. LOUIS
SAN FRANCISCO

The CLEVELAND-CLIFFS IRON COMPANY Cleveland

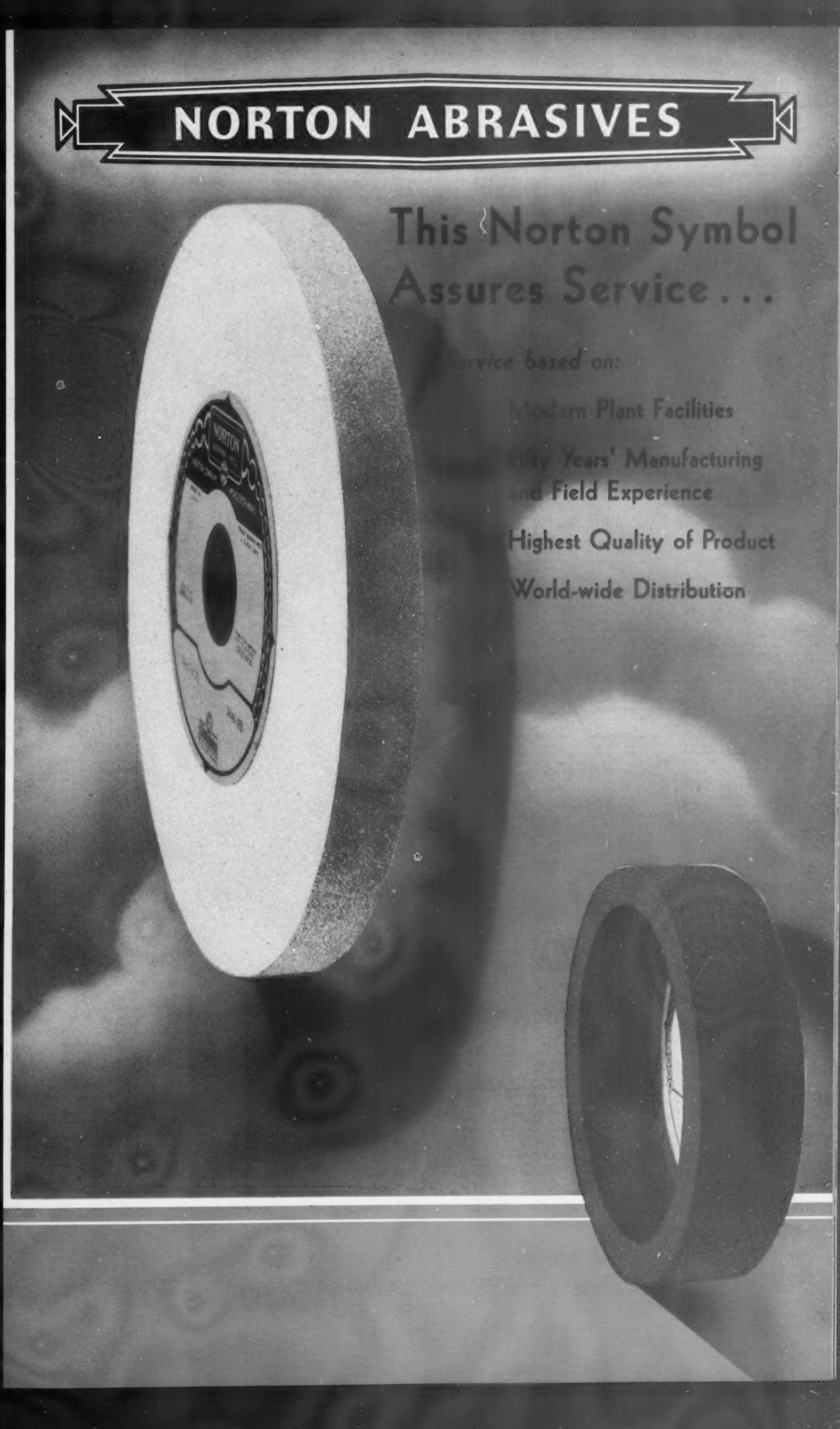
IRON ORE

TRANSPORTATION

COAL

Since 1850

NORTON ABRASIVES



This Norton Symbol Assures Service . . .

Service based on:

Modern Plant Facilities

Fifty Years' Manufacturing and Field Experience

Highest Quality of Product

World-wide Distribution

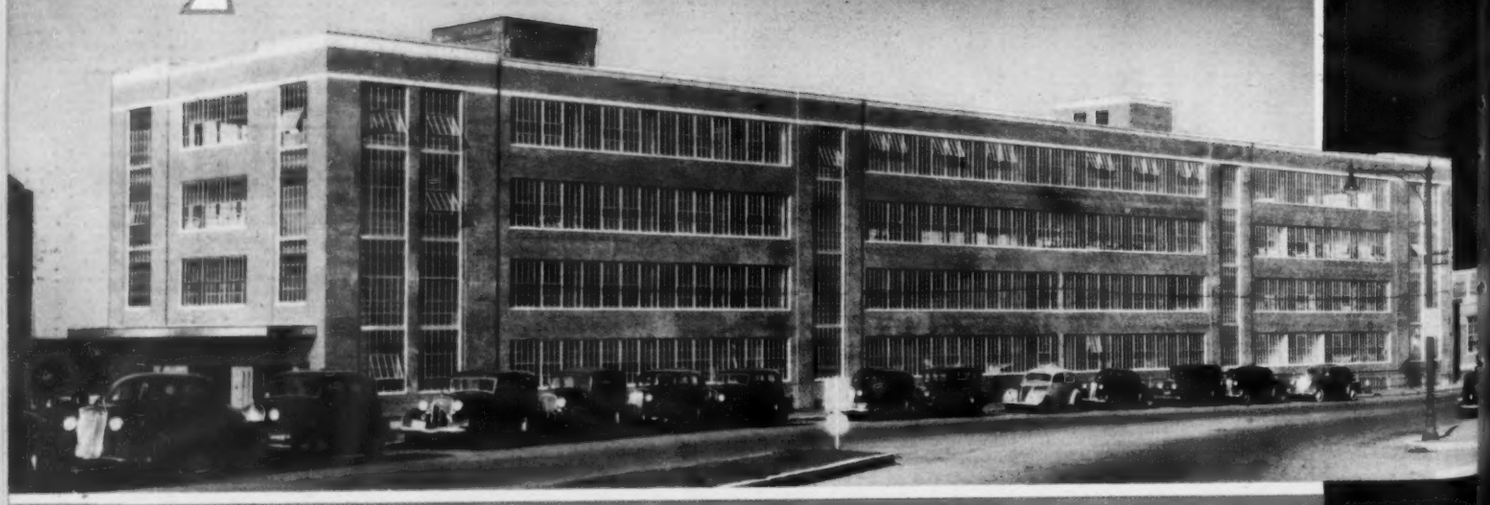
Growing Bigger and Better

EVERY year sees new Norton plant facilities—in the interest of the product and service to users. The 1938 addition shown here replaces fifty-year-old Plant One. To be sure, it is only a small spot on this map of the Norton Worcester plant but it is another important step in a modernization program to still further improve both Norton quality and Norton service.

It is a step also toward providing needed expansion to meet the anticipated 1939 demands.

Perhaps the greatest of all Norton assets is the reputation it has built for Norton service in the world's important plants both large and small—wherever abrasive products are used—wherever grinding machines are employed.

NORTON ABRASIVES



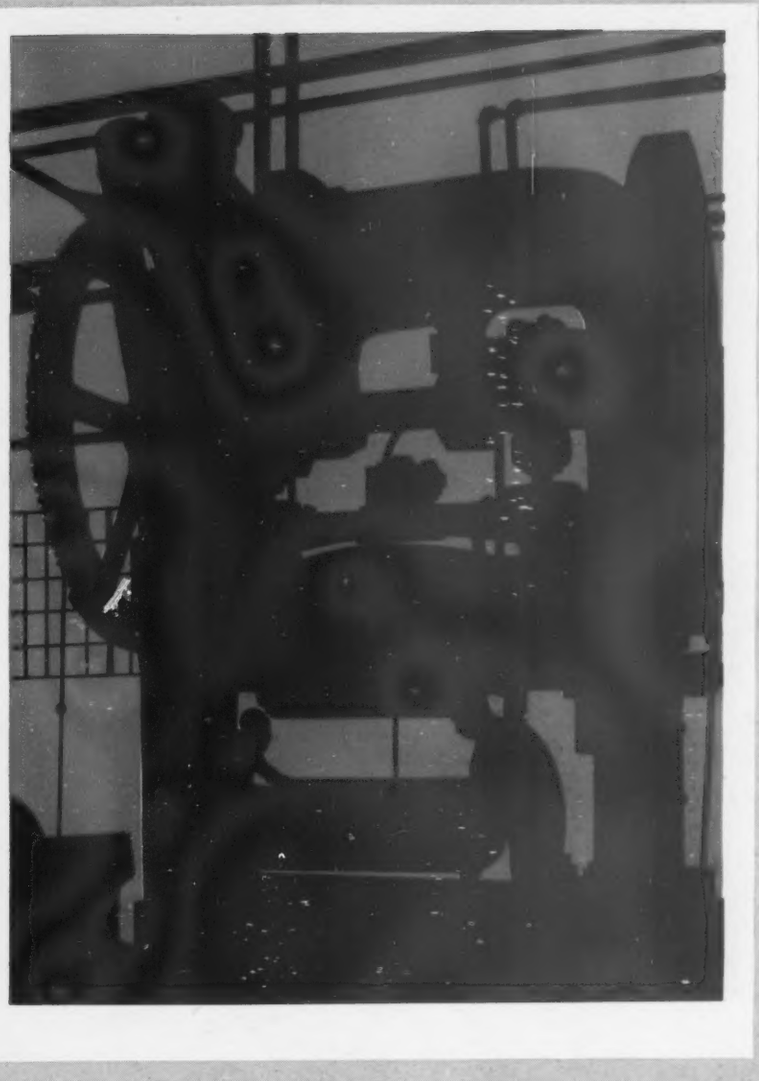
NORTON COMPANY · WORCESTER, MASSACHUSETTS, U. S. A.

New York · Chicago · Detroit · Cleveland · Pittsburgh · Philadelphia · Hartford
Hamilton, Ont. · London · Paris · Wesseling, Germany · Corsico, Italy

Printed in U. S. A.

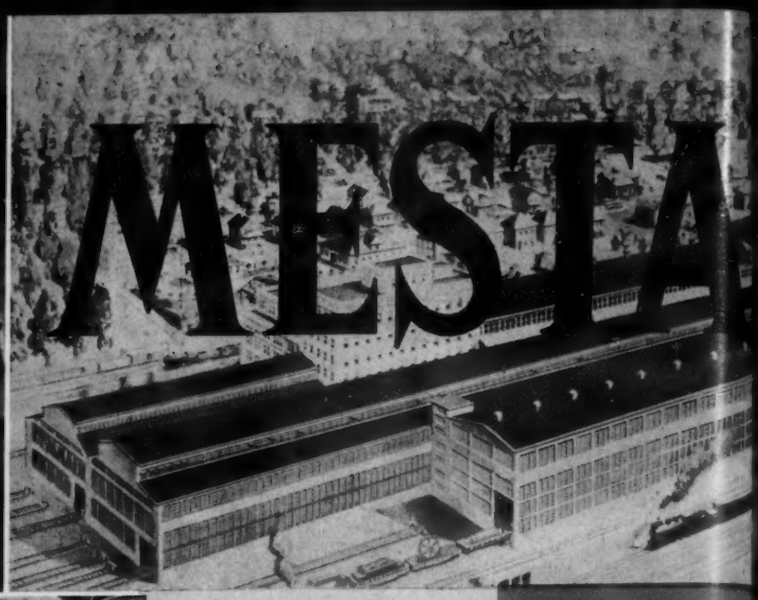
BEHR-MANNING DIVISION, TROY, N. Y.

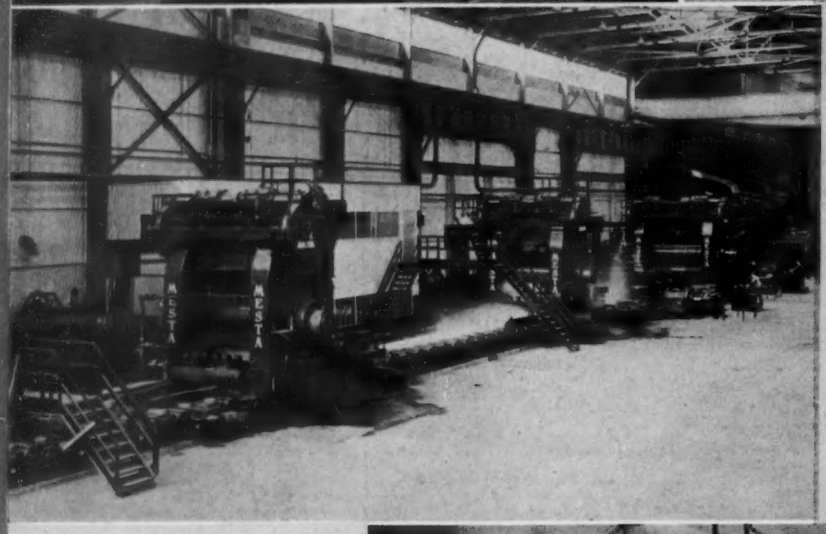
12-38



ENGINEERING
EQUIPMENT AND SERVICE

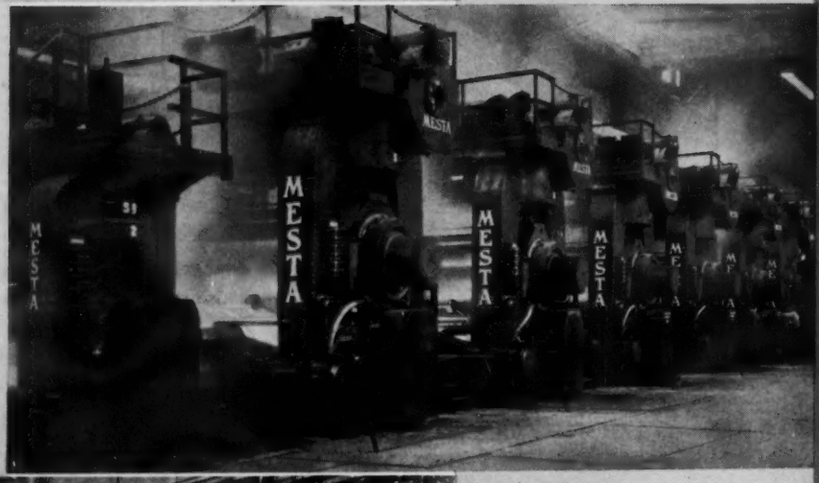
46 Reversing Slabbing-Blooming Mill

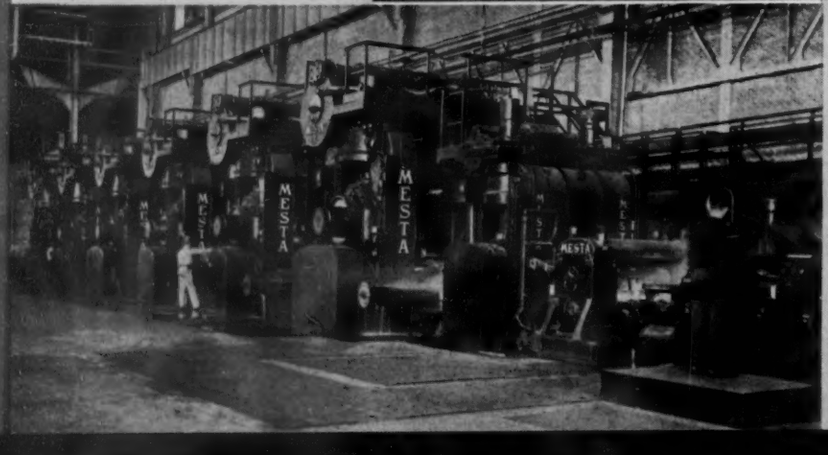




Roughing Stands,
80" Continuous
Four-High Hot Strip Mill

Finishing Stands,
79" Continuous
Four-High Hot Strip Mill



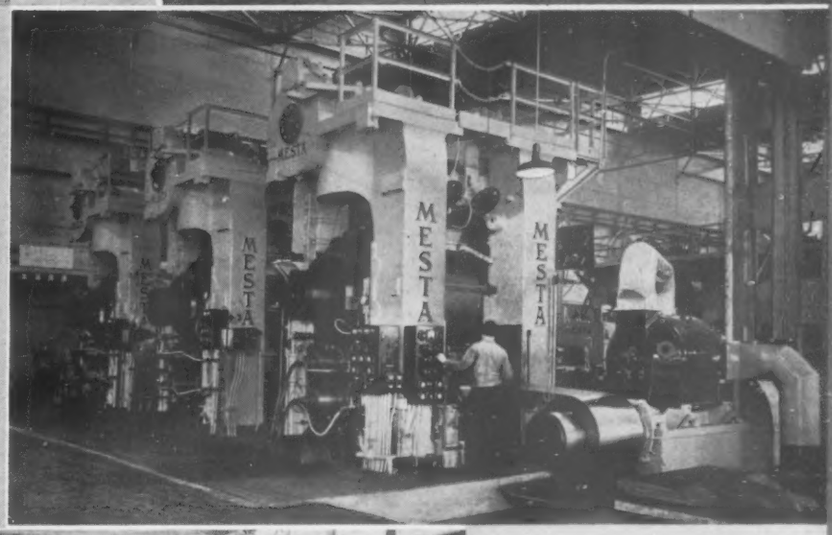


Finishing Stands,
47" Continuous
Four-High Hot Strip Mill

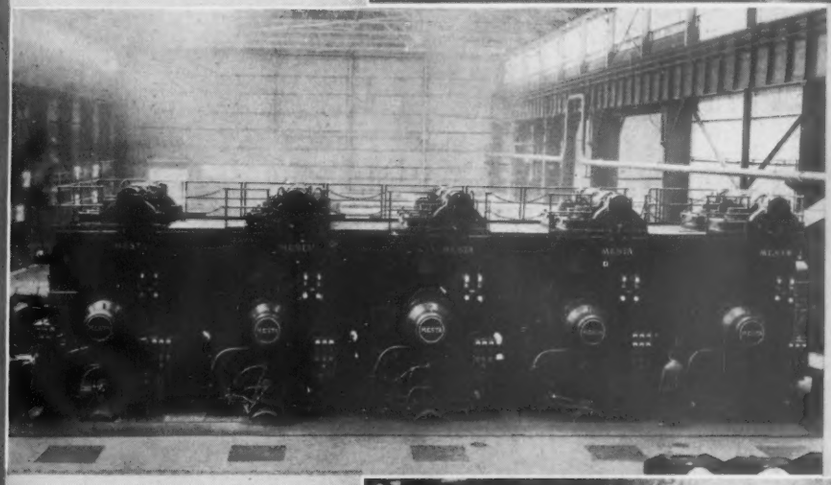
MESTA MACHINE COMPANY

ROLLING MILL EQUIPMENT

93 Single-Stand
Four-High Cold Mill



54" Three-Stand
Tandem Cold Mill for
Rolling Sheet Strip



42" Five-Stand Tandem
Cold Mill for Tin Plate

Electric Welding
Machine for
Butt Welding Strip Steel

PITTSBURGH, PA., U. S. A.

Hyde Park

CHILLED ROLLS AND ROLLING MILL MACHINERY

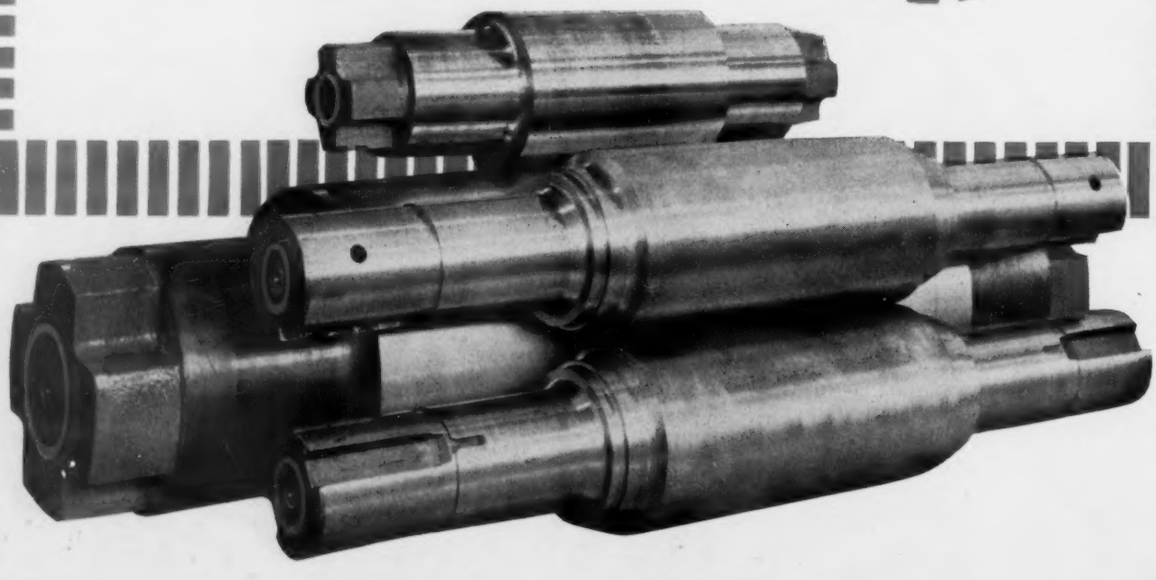
"Red Circle" heat treated Alloy and Plain Chilled Rolls for three and four-high Mills, Sheet and Tin Mills. Moly Rolls, Nickel Chilled, Grain Rolls, Cold Rolls and Sand Rolls.

Sheet and Tin Mill Shears of all kinds, Roll Lathes, Steam Doublers, Sheet Pack Carriers, Stretcher Levellers and Rolling Mill Machinery built to specifications.

Let HYDE PARK Quote on your next requirements.

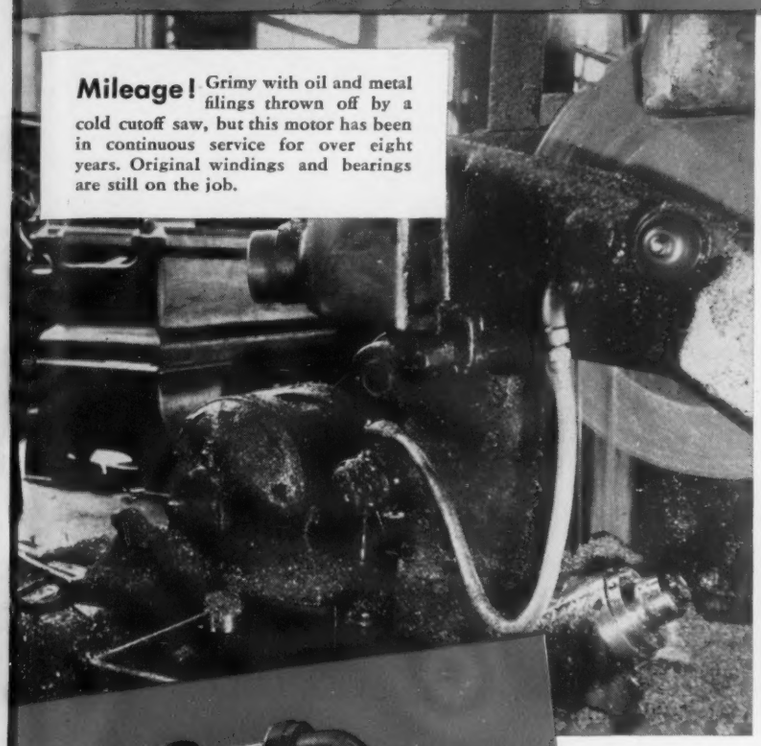
RED CIRCLE Rolls CHILLED

Hyde Park Foundry & Machine Co.
Hyde Park, Pennsylvania
(Pittsburgh District)

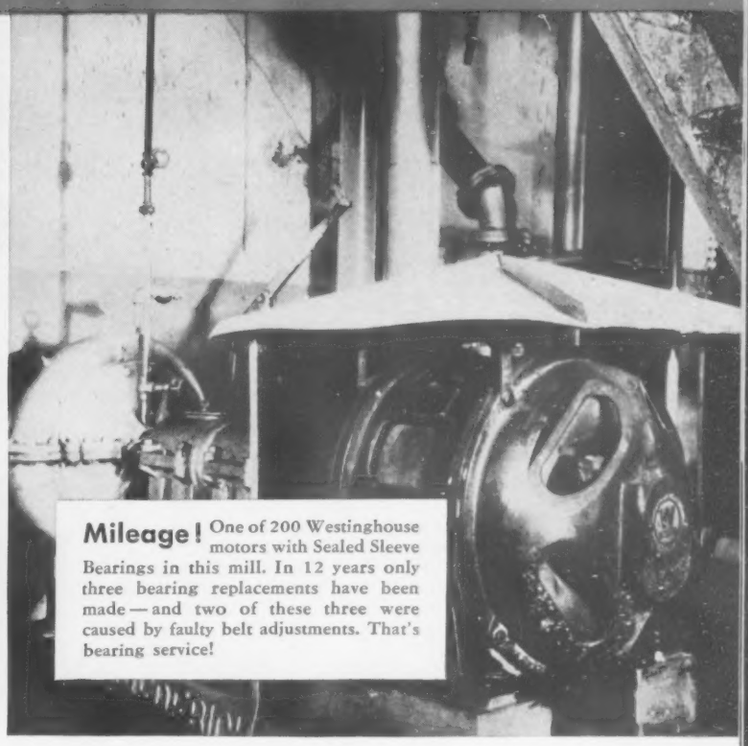


Consider "Mileage" First . . .

IN BUYING AN ELECTRICAL MOTOR



Mileage! Grimy with oil and metal filings thrown off by a cold cutoff saw, but this motor has been in continuous service for over eight years. Original windings and bearings are still on the job.



Mileage! One of 200 Westinghouse motors with Sealed Sleeve Bearings in this mill. In 12 years only three bearing replacements have been made — and two of these three were caused by faulty belt adjustments. That's bearing service!

Convert the turning action of an electric motor into distance — you will be amazed at the mileage piled up during its lifetime. Extra years of service, extra mileage is built into Westinghouse motors.

The big difference in different makes of motors is not in the appea ance outside — it's in the features inside. That is where Mileage is buil

And that is where Westinghouse — and only Westinghouse — ha perfected the three essentials to mileage — to extra years of troubl free service.

1. **TUFFERNELL INSULATION:** Dual protected windings and taped end turns give extra protection against mechanical and electrical damage.

2. **SEALED SLEEVE BEARINGS:** Exclusive Westinghouse bearing seal keeps clean oil in; seals dirt, dust and grit out.

3. **RIGID ONE-PIECE FRAME:** Mechanical parts carry the mechanical load, protecting electrical parts from vibration, torque and strain.

For full details on all types and sizes, simply call your nearest:

Westinghouse Office — Electrical Wholesaler
Motor Dealer — Industrial Agent

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, P

J-205

FROM POWER LINE TO DRIVEN MACHINE
YOU ARE ALWAYS SURE WITH

Westinghouse

MOTORS * CONTROL * CIRCUIT PROTECTIVE EQUIPMENT

The Roll Call

PRODUCTS

The efficiency of any equipment is proven by the number of satisfactory installations and the standing of the users of that equipment in their industry

Thermal Expansion Goggle Valve
Three-Tube Valve—36" to 120" in diameter
Hand or Motor Operated Plate

American Mechanical Goggle Valve
(Hand and Motor Operated)

American Open Joint Checker
(For Blast Furnace Hot Blast Stoves)

American Steel Bottom
(For Blast Furnace Hot Blast Stoves)

Automatic Temperature Control
(For Blast Furnace Stoves)

Bailey Electric Plunger Clay Gun

Stationary Wheel Pig Casting Machine

Vreeland Method and Pug Mill Equipment
(For Mixing Hot Blast Furnace Flue Dust at Dust Catcher)

American Sintering Plant Pug Mill

American Safety Cinder Notch Stopper

American Cold Blast Valve

American Chimney Valve

American Mixer and Check Relief Valve

American Blow-Off Valve

Hot Blast Valve

Combined Check and Snort Valve

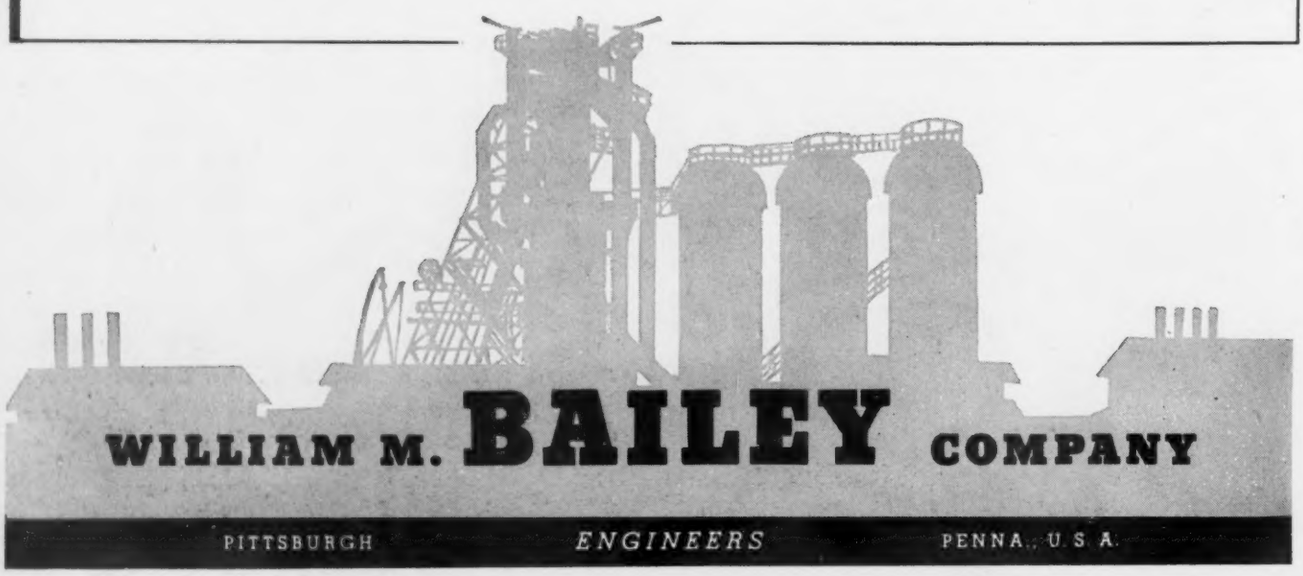
Blast Furnace Mixer and Drop Valve

American Water Metering Method
(For Wetting Charge in Blast Furnace Skip Car)

American Pig Releaser

American Ladle Skulling Hook

"Superior" Checker for Regenerative Furnaces



WILLIAM M. BAILEY COMPANY

PITTSBURGH *ENGINEERS* PENNA., U.S.A.

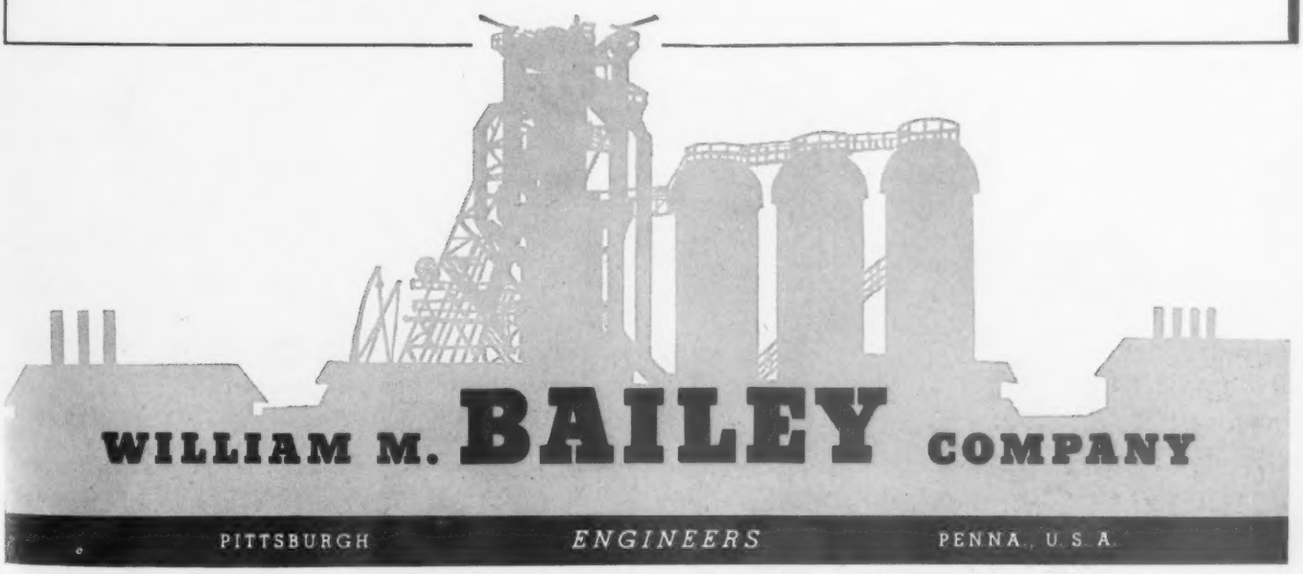
European Representative: Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees, England

The Roll Call

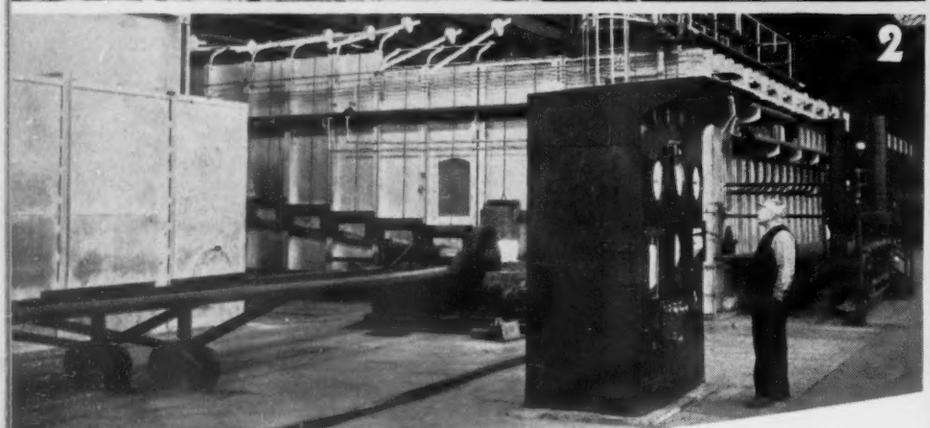
CUSTOMERS

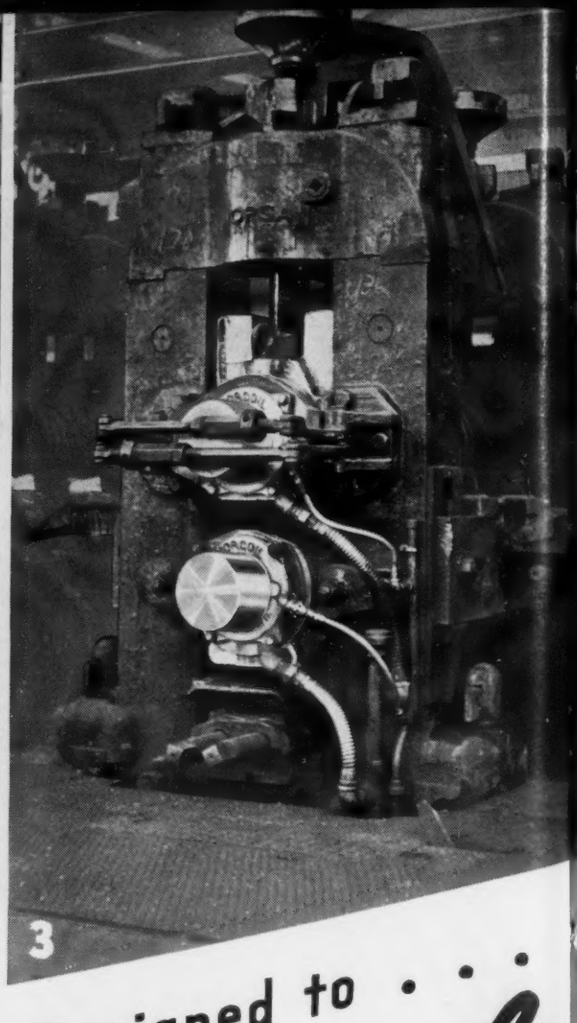
American Rolling Mill Company
American Steel & Wire Company
Bethlehem Steel Company
Carnegie-Illinois Steel Corporation
(Pittsburgh and Chicago Districts)
Central Alloy Steel Corporation
Chateaugay Ore & Iron Company
Davison Coke & Iron Company
Donner Steel Company
Ford Motor Company
General Electric Company
Great Lakes Steel Corporation
Gulf States Steel Company
Hamilton Coke & Iron Division
Hanna Furnace Corporation
Inland Steel Company
International Harvester Company
Jones & Laughlin Steel Corporation
Latchford Glass Company
Minnesota Steel Company
National Tube Company
Pittsburgh Crucible Steel Company
Pittsburgh Steel Company
Republic Steel Corporation
Sloss-Sheffield Steel & Iron Company
Tennessee Coal, Iron & Railroad Company
Toledo Furnace Company
Weirton Steel Company
Wheeling Steel Corporation
Wickwire Spencer Steel Company
Alan Wood Iron & Steel Company
Youngstown Sheet & Tube Company

Appleby-Frodingham Iron & Steel Company, Ltd., Liverpool, England
Colvilles, Ltd., England
Dominion Steel & Coal Corporation, Ltd., Sydney, Nova Scotia
Ford Motor Company, Ltd., Dagenham, Essex, England
Metalloimport, Magnitostroy, Magnitogorsk Gorod Samara, Slatoustin, J. D., U. S. S. R.
Oesterreichisch-Alpine Montangesellschaft, Vienna, Austria
South African Iron & Steel Industrial Corporation, Ltd., South Africa
Stewarts & Lloyds, Ltd., Corby, England
Tata Iron & Steel Company, Ltd., Jamshedpur, India
Shelton Iron & Steel Co., England
Hermann Goering Steel Works, Germany
J. Lysaught & Co., England



European Representative: Ashmore, Benson, Pease & Co., Ltd., Stockton-on-Tees, England





Morgan Construction Company Offers an Engineering Service Designed to . . .

Take the Lags out of

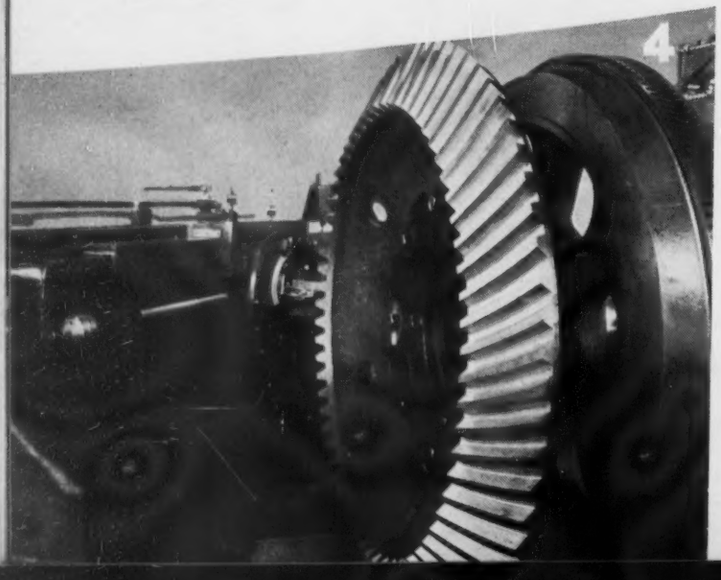
1 Morgan has made vital improvements in Billet Handling and Furnace Charging Equipment, many of which can be applied to existing mills.

2 The modern Reheating Furnace, with complete instrumentation, insures uniform temperatures, continuous production, and higher yields.

3 Morgan Rod Roughing Stands as built today include Morgoil Bearings with Axial Pass Alignment Clamps and other important features that save time, power—and improve output and product.

4 Morgan pioneered the large spiral bevel gear drive, and designed and built the machines required to make these gears. Morgan drives are built for the needs of today, *and tomorrow.*

5 The Flying Shear first introduced by Morgan has been developed to its present size and high degree of perfection, permitting new production peaks in continuous rod and billet mills.



Are you getting your share of the Bar, Merchant and Wire Rod business?

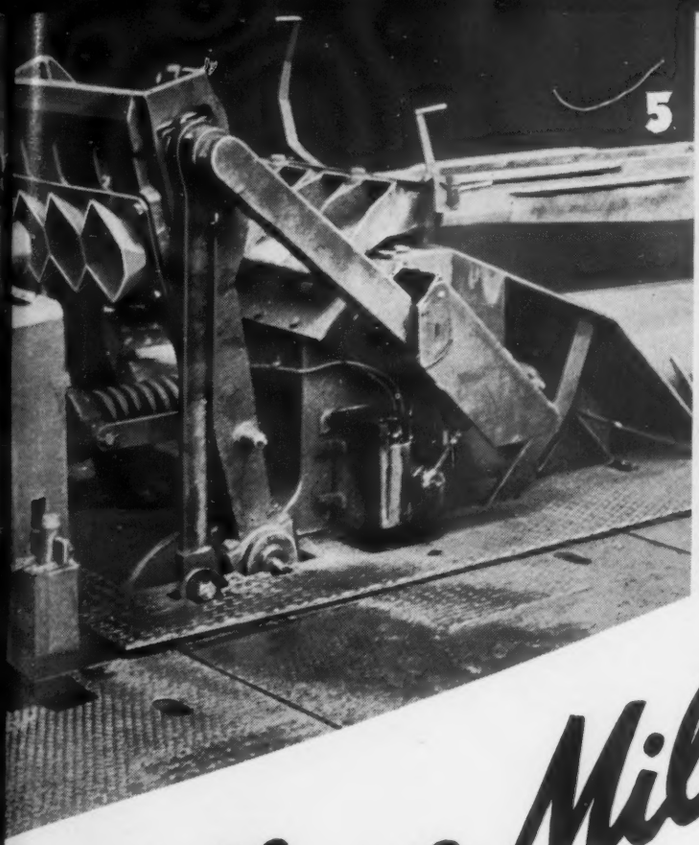
Or do "bottle necks" cause LAGS that set a lower standard of production speed and quality for your continuous mills?

If so, possibly many of these lags can be removed with new Morgan equipment. Morgoil Bearings have reduced friction loads and increased the productive capacity of existing power drives. Shears of all types can often replace obsolete or worn-out equipment without requiring major alterations in the mill.

Morgan Construction Company is prepared to survey your mill with a view to removing "bottle necks"; to tune up production by eliminating lags that cause lost business in today's —and tomorrow's—markets. A Morgan Report will give you the facts, and may open the way to new profits without heavy investment.

MORGAN CONSTRUCTION COMPANY
WORCESTER, MASSACHUSETTS, U. S. A.

R-48



Rolling Mill Production

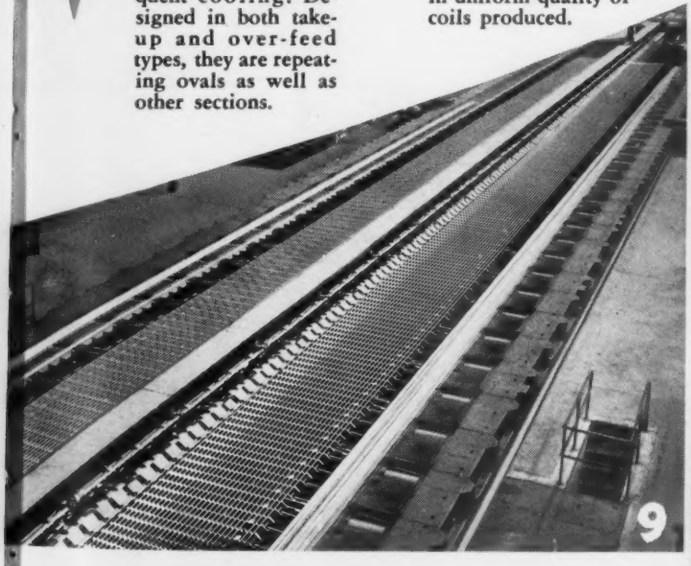
6 Morgan Repeaters permit higher operating speeds, reduce exposure and consequent cooling. Designed in both take-up and over-feed types, they are repeating ovals as well as other sections.

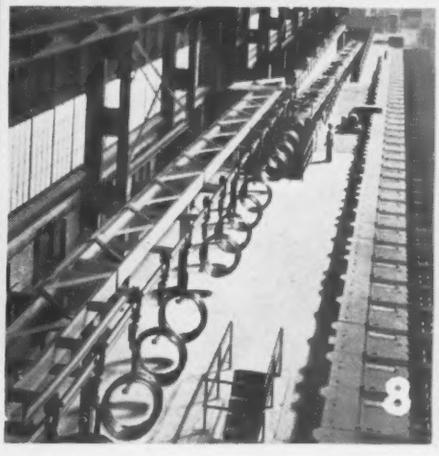
7 Laying and Pouring Reels as developed by Morgan embody the cumulative refinements of more than 40 years' engineering experience. They keep up with modern rod mills—in speed and in uniform quality of coils produced.

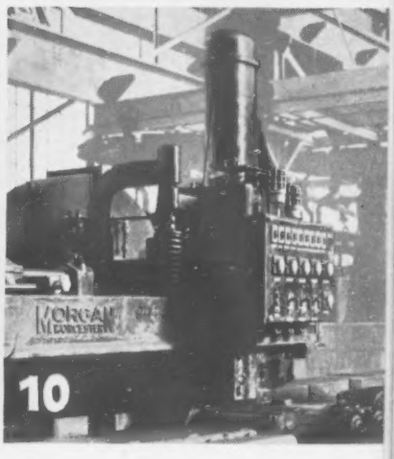
8 Morgan Chain Conveyors, "Take-Off" and Coil Hook Carrier systems embody many new and exclusive features, designed to meet modern needs in production and safety.

9 The Hot Run-out and Carry-over Bed as incorporated in the modern Morgan Mill is an ***automatic machine,*** each bar passing across to the Cold Run-out straight and true.

10 Bar Shears embody new features insuring greater facility of operation and higher output.

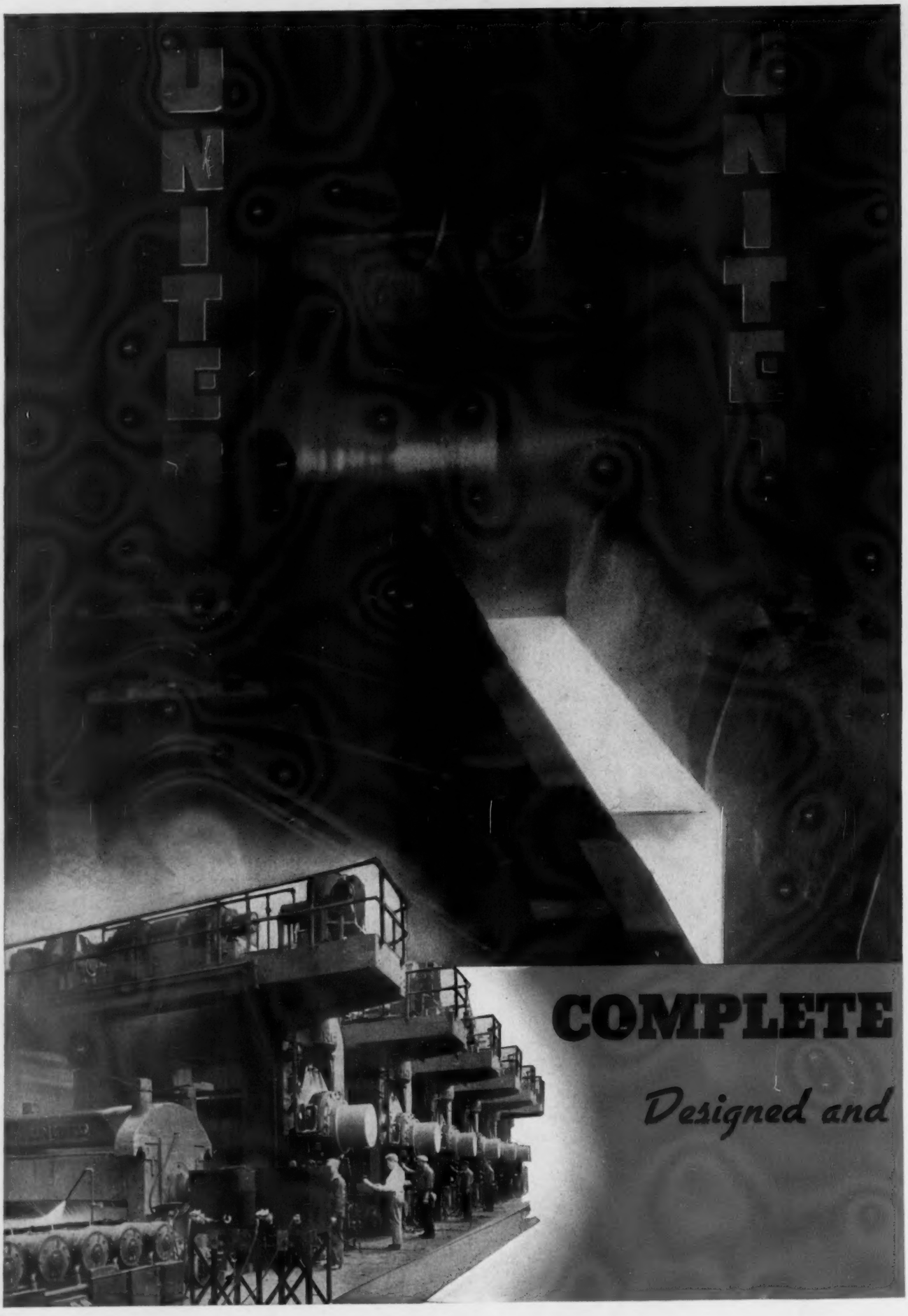


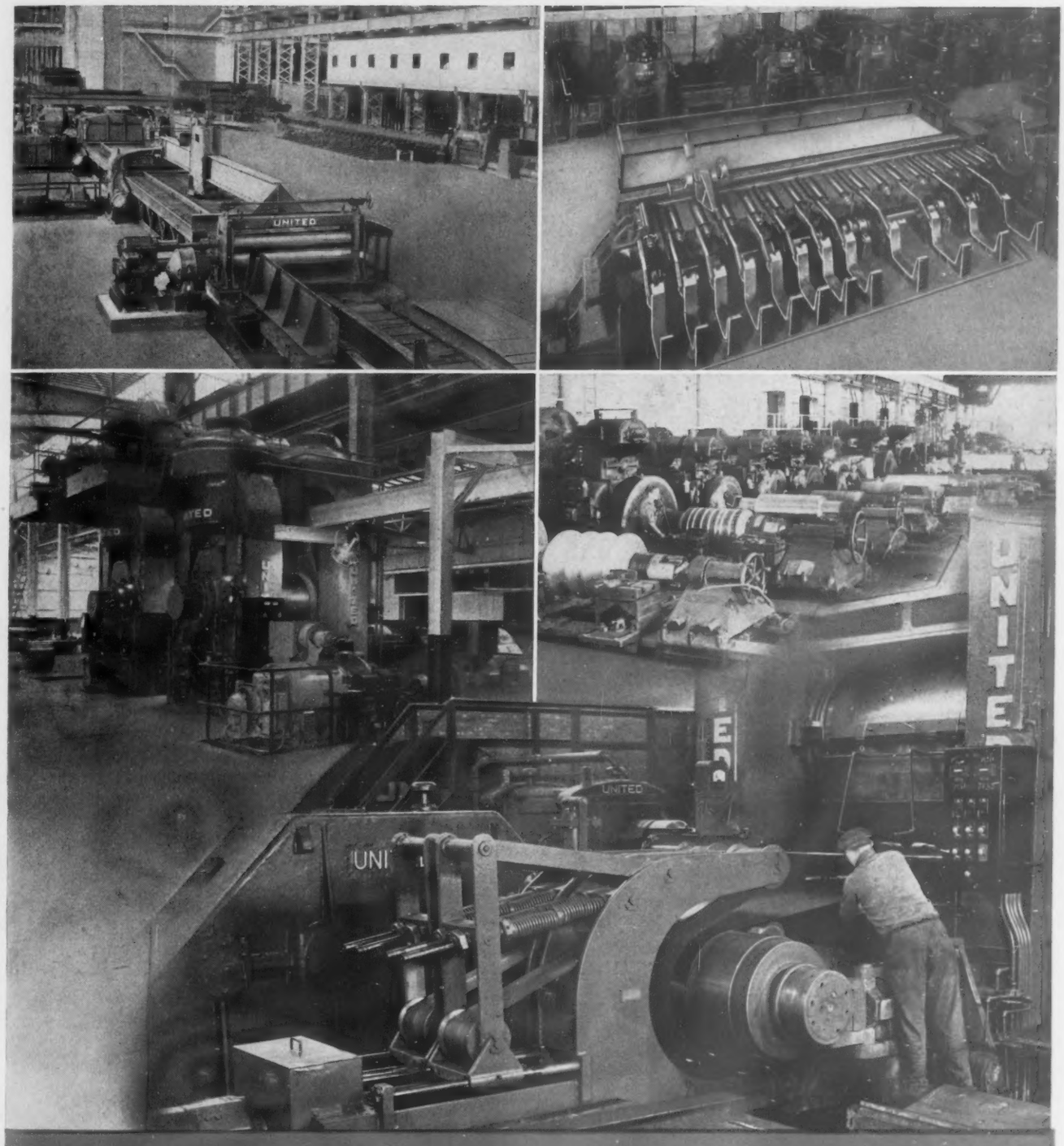




MORGAN
WORCESTER
ENGINEERS AND
MANUFACTURERS

Continuous
ROLLING MILL EQUIPMENT


UNITE
UNITE
COMPLETE
Designed and



ROLLING MILL EQUIPMENT

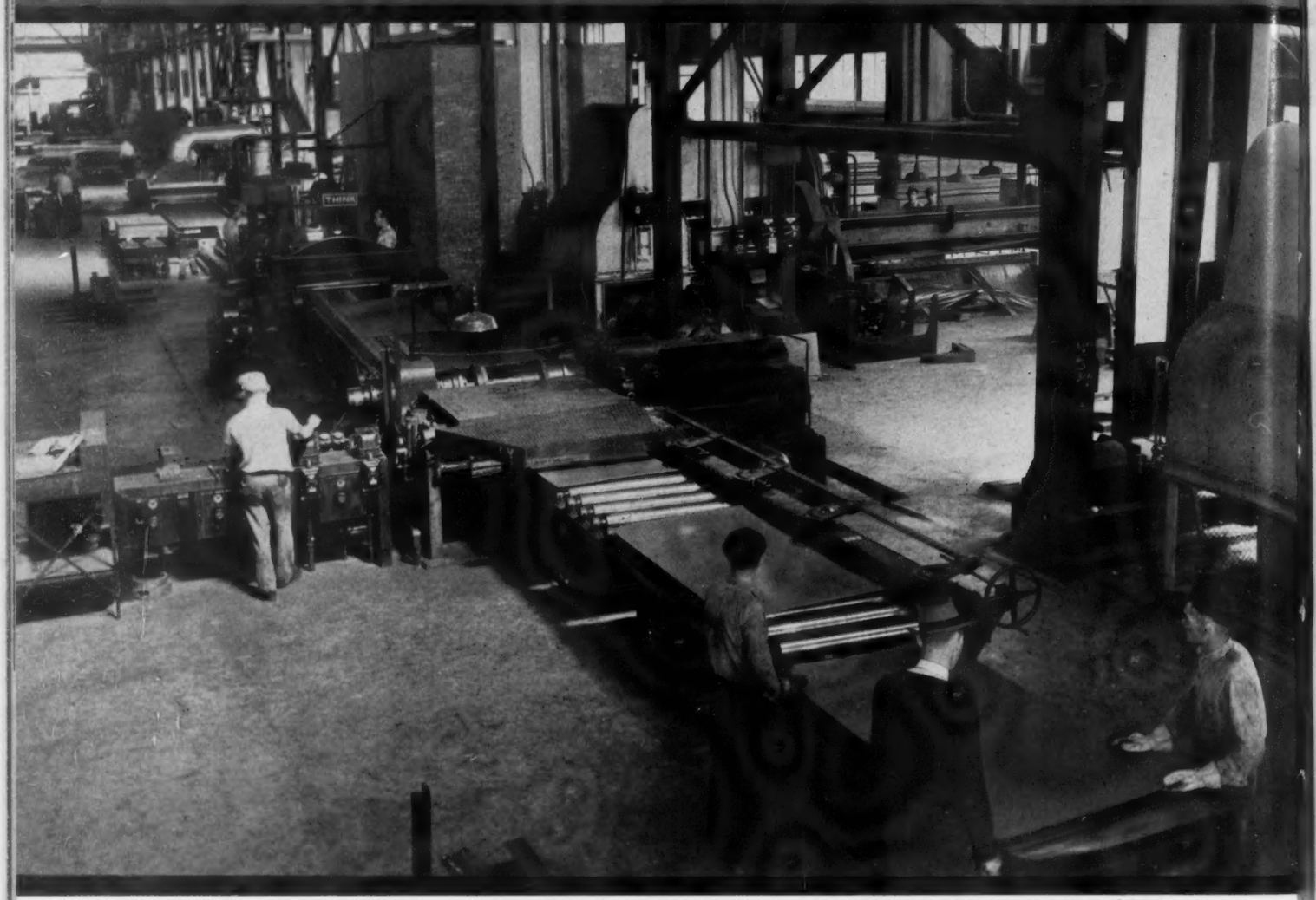
Built by **UNITED**

ENGINEERING AND FOUNDRY COMPANY

PITTSBURGH · PENNSYLVANIA

Associated Companies: Davy and United Engineering Co., Ltd., Sheffield, England, Dominion Engineering Works, Montreal, P. Q.

The Stamco Lin



We specialize in patented Resquaring Units for plates, sheets and tinplate.
GUILLOTINE and ROTARY TYPES

Stamco SHEET and PLATE MACHINERY

Power Squaring Shears - Continuous Mill Shears - Ridge Roll Dies and Presses - Power Gap Shears - Corrugating Rolls - Conductor Pipe Machinery - Gang Slitting Shears.

Corrugating Presses - Roll Roofing Machinery - Sheet Mill Shears - Crimping Rolls - Edgers and Folders - Tin Mill Shears - Roofing Presses - Wahlert Roll Polishers.

We can furnish shears in welded steel, cast steel or semi-steel construction.
Mechanical holddown, hydraulic holddown, friction clutches, electric back gauges.

THE STREINE TOOL & MFG. CO.
NEW BREMEN, OHIO

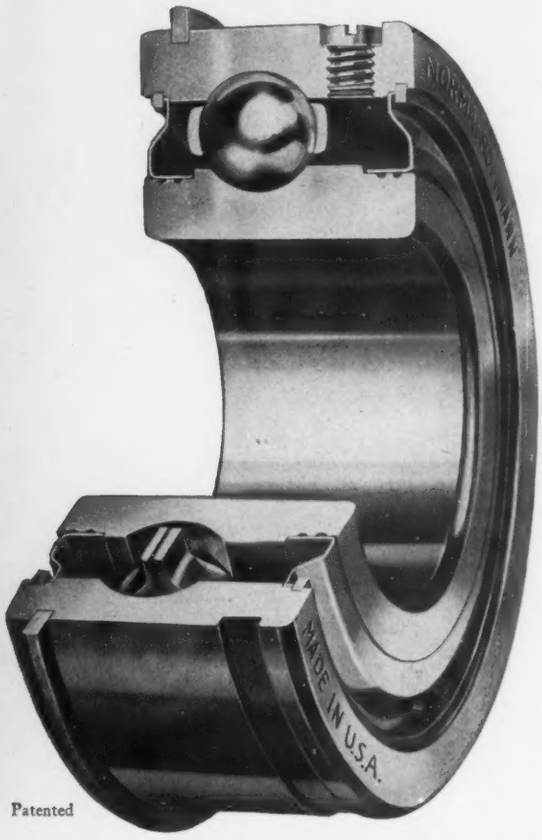
CARTRIDGE

SIMPLIFY YOUR DESIGN—DOUBLE YOUR GREASE CAPACITY—

ELIMINATE DIRT HAZARD

WITH THIS

Ideal Self-Sealed Bearing



Patented

MADE TO STANDARD DOUBLE-ROW WIDTHS WITH 100% GREATER GREASE CAPACITY

Available in Four Different Series

"3600".....with standard outer ring.
"43600".....with shoulder ring in outer ring.
"3600-J".....with refilling plug in outer ring.
"43600-J".....with shoulder ring and refilling plug in outer ring.

Can be packed with at least 100% more grease than any other self-sealed bearing—especially adapted, therefore, for continuous service for long periods.

Eliminates the dirt hazard and insures absolute retention of lubricant—by the use of flanged metal shields, recessed inner ring construction and two or more grease grooves, the combination affording a truly effective labyrinth.

Is equally efficient in retaining grease in horizontal or vertical position.

Flanged metal shields, though rigidly located by snap rings, are removable to facilitate inspection, cleaning or re-greasing of bearing.

Can be quickly regreased, either through built-in refilling plug opening or by removing metal shields.

Requires no lock nuts on shaft or clamping means in housing, because of wide contact areas due to double-row width of both rings—which also safeguard against "cocking" and prevent slippage or "peening".

Shortens over-all length of mounting and reduces overhang of shaft.

Reduces costs by simplifying design, eliminating protective closure parts, and saving attendant labor.

Available with shoulder ring, thus permitting a through bore in housing, the shoulder ring providing endwise location.

Placed on the market only after years of exacting tests in our laboratory and in the field under continuous operation, the "CARTRIDGE" BEARING has conclusively demonstrated its ECONOMY, EFFICIENCY and SUPERIORITY. A constantly increasing number of representative manufacturers of electric motors, machine tools, pumps, woodworking machinery, and other equipment is adopting it because of its proved merit. Write for Catalog showing typical "Cartridge" mountings.

NORMA-HOFFMANN BEARINGS CORPN., STAMFORD, CONN. U.S.A.

BEARING

NORTH AMERICA
SOUTH AMERICA
EUROPE
AFRICA
ASIA
AUSTRALIA
GREENLAND
UNITED STATES
CANADA
ARCTIC OCEAN
ATLANTIC OCEAN
PACIFIC OCEAN
INDIAN OCEAN
Barents Sea
North Cape
Bering Sea
Caspian Sea
Black Sea
Mediterranean Sea
Arabian Sea
Bay of Bengal
China Sea
Sea of Okhotsk
Sea of Japan
Yellow Sea
Java Sea
Timor Sea
Tasman Sea
Coral Sea
Gulf of Mexico
Caribbean Sea
Hudson Bay
Baffin Bay
Greenland Sea
Norwegian Sea
North Sea
Baltic Sea
Bay of Biscay
Red Sea
Persian Gulf
Gulf of Aden
Arafura Sea
Banks Island
Victoria Island
Prince Patrick Island
Ellesmere Island
Cape Farewell
Iceland
Reykjavik
Jan Mayen Is.
Spitsbergen
Azores
Bermuda
West Indies
Cape Verde Is.
Ascension Is.
St. Helena Is.
Falkland Is.
Georgia
Kerguelen Is.
Low Archipelago
Solomon Is.
Fiji Is.
Marshall Is.
Guam
Philippine
Formosa
Sumatra
Java
Ceylon
Madagascar
Cape of Good Hope
Cape Horn
Cape Town
Cape Farewell
Cape Horn
Hudson Strait
Davis Strait
Denmark Strait
Bering Strait
Gibraltar Strait
Magellan Strait
Panama Canal
Suez Canal
Mozambique Channel
Torres Strait
Bass Strait
Cook Strait
Tasmania
Hobart
Melbourne
Sydney
Canberra
Brisbane
Adelaide
Perth
Albany
Wellington
Auckland
Yokohama
Tokyo
Kamchatka
Kuril Is.
Yakutsk
Irkutsk
Yenisseisk
Novosibirsk
Mukden
Peiping
Tientsin
Shanghai
Hankow
Canton
Manila
Saigon
Bangkok
Rangoon
Calcutta
Madras
Bombay
Karachi
Baghdad
Tehran
Mecca
Muscat
Addis Ababa
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Zanzibar
Mozambique
Tananarivo
Lourenco Marques
Pietermaritzburg
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Luanda
Freetown
Monrovia
Accra
Lagos
Dakar
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Rabat
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Italian Somaliland
Mogadiscio
Portuguese Guinea
Gambia
Liberia
Ivory Coast
Gold Coast
Nigeria
Cameroons
French Equatorial Africa
Belgian Congo
Angola
Rhodesia
Bechuanaland
Basutoland
Swaziland
Natal
Orange Free State
Transvaal
Cape Province
Mozambique
Portuguese East Africa
Madagascar
Mauritius
Reunion
Seychelles
Aden
Muscat
Arabian Sea
Persian Gulf
Iraq
Iran
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Philippines
Formosa
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Korea
Manchuria
Mongolian Republic
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Tibet
Nepal
Bhutan
Sikkim
Assam
Bengal
Bihar
Orissa
Madhya Pradesh
Uttar Pradesh
Punjab
Kashmir
Rajputana
Gujarat
Bombay
Mysore
Hyderabad
Madras
Travancore
Cochin
Ceylon
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Fiji Is.
Solomon Is.
Marshall Is.
Guam
Philippine

ATLAS SCALE CARS AND TRANSFERS

assure lowest haulage costs

Atlas Transfers Used in Ore Yard and at Unloading Dock

100 TON—CABLE BOTTOM DUMP TRANSFER CARS

6-Wheel Welded steel trucks provided with anti-friction self-aligning bearings

Motor-driven discharge gates operated independently on each side of cars

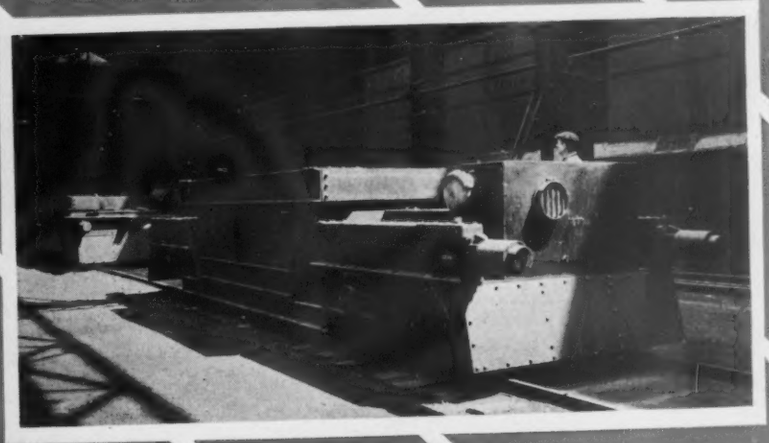
Elevated operators cab for observation of loading and car operation

Discharge gates and bottom of hopper plates provided with electrically operated heaters to prevent freezing of materials in cold weather.

Accurate Weighing of Burdens Recorded on Direct-Reading Tape is Accomplished with Atlas Scale Cars

320 CU. FT. CAPACITY—BOTTOM DUMP SCALE CARS

Atlas all-steel roller suspension type scale provided with Atlas Indicating Dial and Type Recording Apparatus permitting direct reading of separate burden weights. Cast-steel one piece side frame trucks with anti-friction self-aligning bearings.



Atlas Cars for Every Kind of Inter-Plant Haulage

ELECTRICALLY OPERATED BUCKET TRANSFER CARS.
DOUBLE END OPERATION

●

ATLAS PRODUCTS

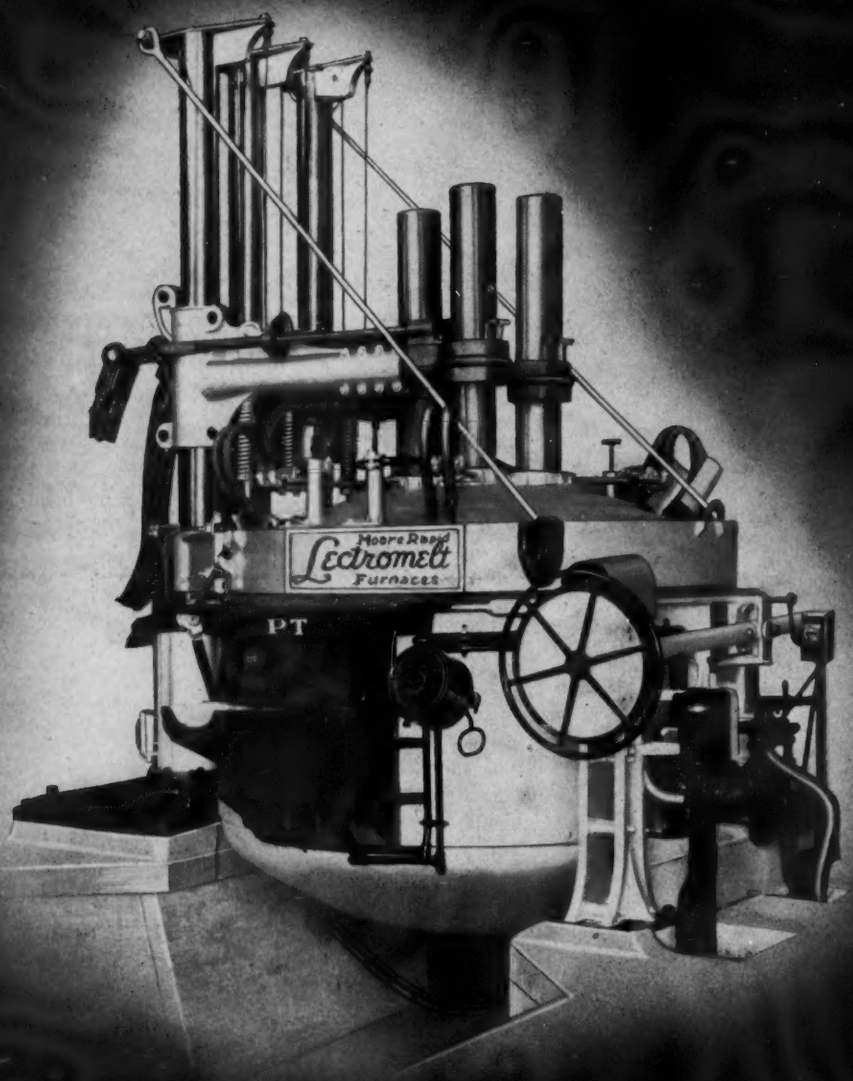
Electric Locomotives and Cars, Storage Battery Locomotives, Transfer Cars, Scale Charging Cars, Specially Designed Cars for All Purposes, Diesel Electric and Gas-Electric Locomotives, Storage Battery Trucks and Tractors, By-Product Coke and Gas Plant Equipment.

THE ATLAS CAR & MFG. CO.

Engineers *Manufacturers*

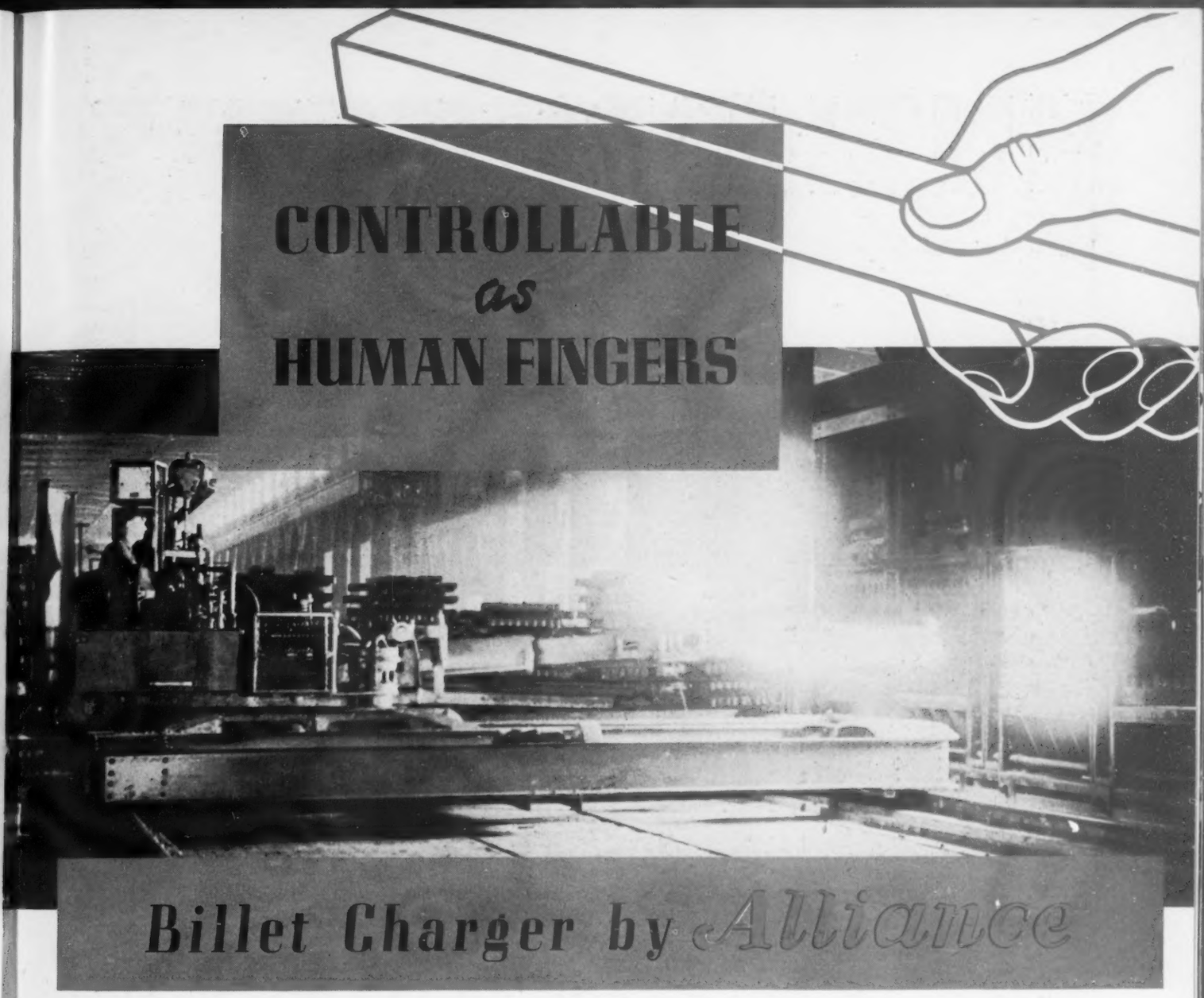
CLEVELAND, OHIO

MOORE RAPID Lectromelt FURNACES



Pittsburgh Lectromelt Furnace Corporation

PITTSBURGH, PA.



CONTROLLABLE *as* HUMAN FINGERS

Billet Charger by *Alliance*

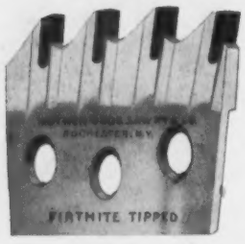
Designed and built by ALLIANCE (Largest Builders of the World's Largest Cranes) this modern Billet Charger serves the steel industry with engineering refinements in keeping with heavier production methods. Performing in a minimum of space and with controls fully centralized about the operator, it both charges and removes from the furnace a *continuous* flow of billets for your mill . . . *and with a handling precision deft as the human grip.*

ALLIANCE *designs* and *builds* Ladle Cranes, Ingot Strippers, Soaking Pit Cranes, Open Hearth Charging Machines, Slab and Billet Charging and Drawing Machines, Standard Cranes, Gantry Cranes, Ore and Coal Bridges, Car Dumpers, Forging Manipulators, Board and Steam Drop Hammers, Coal Pier Equipment, Rolling Mill Machinery and Special Machinery . . . *all to your individual requirements.*

THE ALLIANCE MACHINE COMPANY

Designers and Builders **ALLIANCE, OHIO**

HUTHER SAWS



Segment with Firthite tips for Huther Bros. Patent Inserted Tooth Saw.

Huther Bros. Patent Inserted Tooth Milling Saw with inserts of best quality High Speed Steel, the ideal saw for cutting brass, copper, and aluminum, leaves cut perfectly smooth —a real production tool. Saw has side clearance, sharpen on top of tooth only. Let us tell you more about this saw.

FIRTHITE TIPPED SAWS

FIRTHITE-TUNGSTEN CARBIDE, made by Firth Sterling Steel Corp., is used for tipping this saw. For cutting non-ferrous metals, fibres, plastics, etc. Write for full information.

• • •

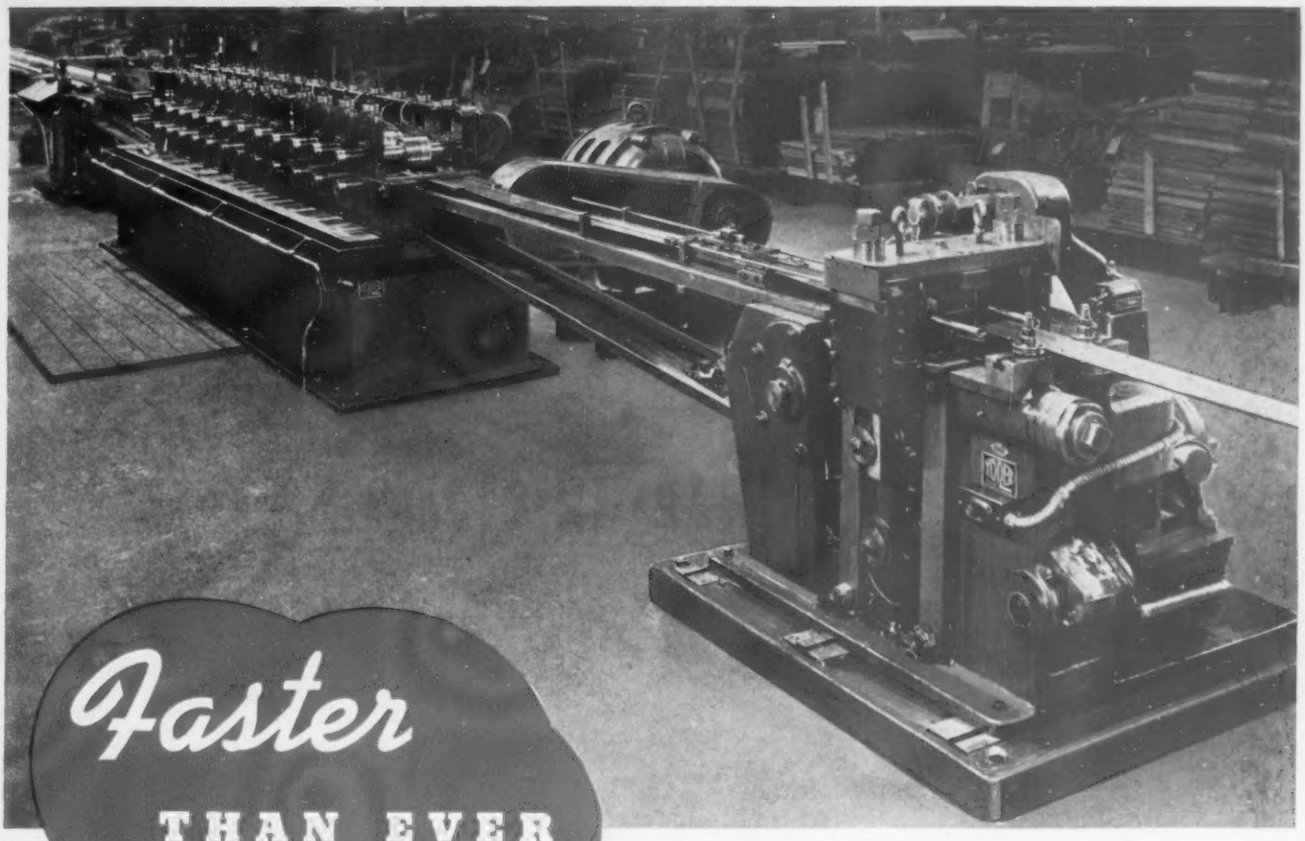
HUTHER SEMHI HARD EDGE
(TRADE MARK)
METAL CUTTING BAND SAW

Write for prices . . . Advise material to be cut and speed

HUTHER BROS. SAW MFG. CO.

ROCHESTER, N. Y.

STRAIGHT LINE PRODUCTION

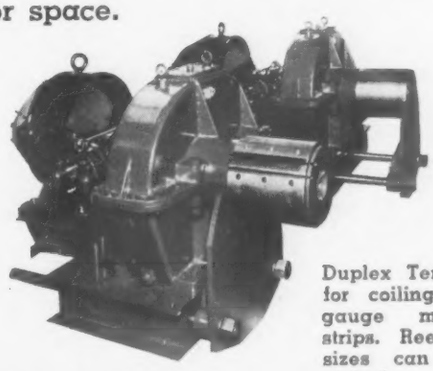


Faster
THAN EVER BEFORE!

A cold roll forming line for notching, perforating, forming and cutting to length automatically on the fly, saves many operations, increases production, and saves floor space.

OTHER YODER PRODUCTS:

- Slitters and Side Trimming Shears
- Coilers and Uncoilers
- Tension Reels
- Levellers
- Edge Conditioning Machines
- Automatic Bending Machines
- Pipe Forming Mills—large and small
- Pipe Sizing and Straightening Units
- Structural Cold Forming Mills
- Automatic Flying Shear & Saw Cutoff Machines
- Special Steel Mill & Automotive Machinery
- Complete Engineering Service



Duplex Tension reel for coiling of light gauge multiple strips. Reels of all sizes can be furnished.

YODER CAN HELP YOU SOLVE YOUR PRODUCTION PROBLEMS!

THE YODER CO.

W. 55th ST. AND WALWORTH AVE. CLEVELAND, OHIO
PLATE AND SHEET METAL MACHINERY SPECIALISTS

"NATIONAL" ROLL

We specialize in

ROLLING MILL MACHINERY

SPECIAL CHILLED ROLLS
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ROLLS

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EXTRA HARD ALLOY ROLLS FOR BRASS, COPPER, ALUMINUM, ZINC

SPECIAL WORK ROLLS
FOR FOUR-HIGH MILLS

The National Roll & Foundry Company
Office and Works: AVONMORE, PA., U. S. A.

STEAM DROP HAMMER

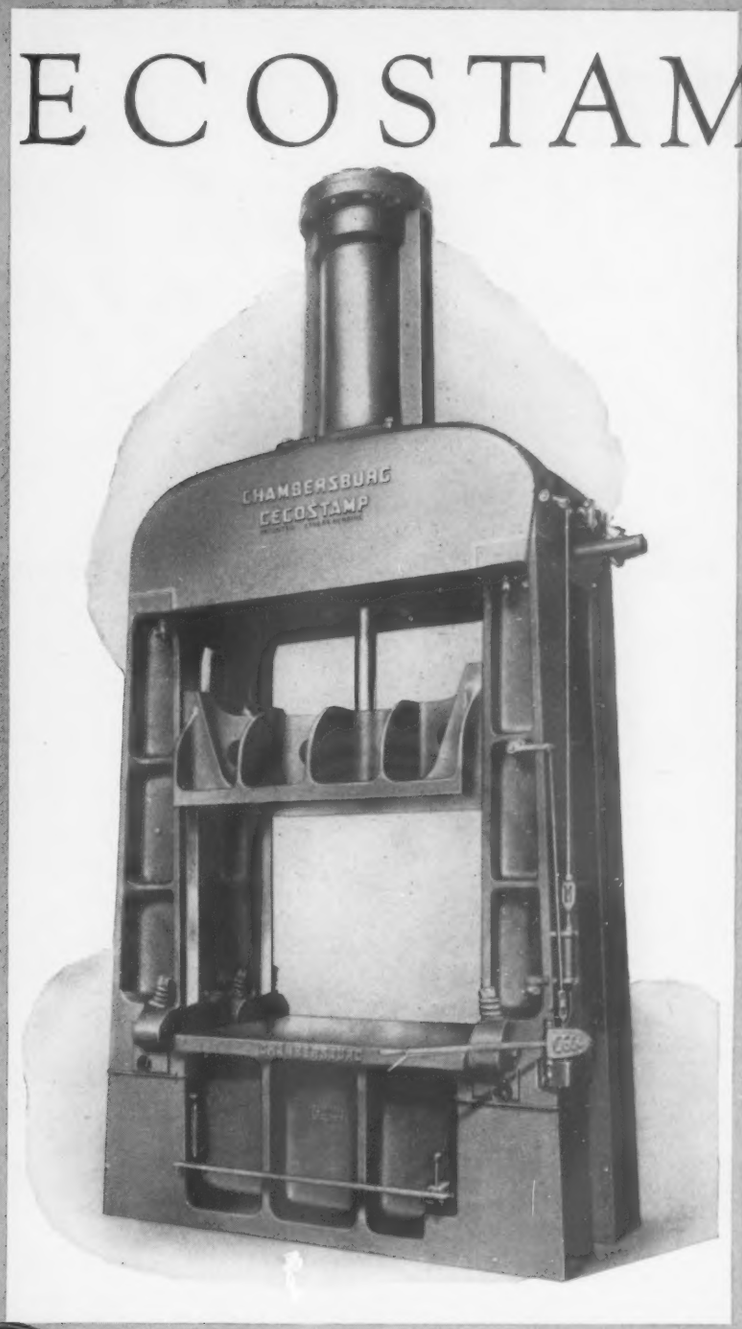
STEAM FORGING HAMMER

BOARD DROP HAMMER

STEAM-HYDRAULIC PRESS

The NEW CHAMBERSBURG

CECOSTAMP



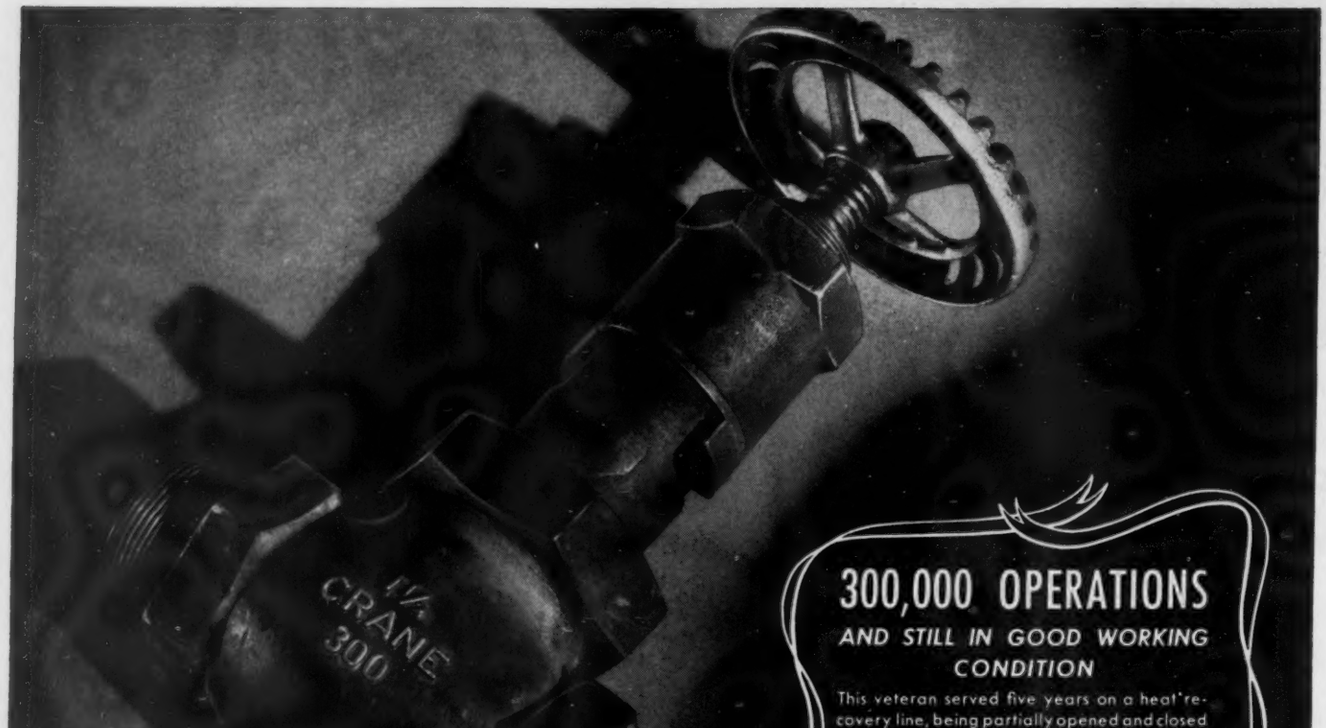
BACKED by over forty years' experience in the design, construction and operation of impact machinery, the new Chambersburg CECOSTAMP offers a modern and completely satisfactory solution to problems such as:

1. Forming stainless steel and other hard-to-form alloys of low ductility.
2. Forming thin hot work that cools quickly.
3. Embossing, and work hard to set to final shape.
4. Producing small-quantity, short-run work at low cost.

CHAMBERSBURG ENGINEERING CO. • CHAMBERSBURG, PA.

CHAMBERSBURG

HAMMERS · PRESSES · CECOSTAMPS · HYDRAULIC MACHINERY



300,000 OPERATIONS

AND STILL IN GOOD WORKING CONDITION

This veteran served five years on a heat-recovery line, being partially opened and closed every four minutes seven hours a day for five years—exceptional service even from a valve of exceptional quality. A tribute to the practical applications of Crane research.

". . . to unearth new facts"

Recently, the newly completed Crane Research Laboratories, housing the largest and best equipped research facilities in the industry, were open to public view. In the foreword of a booklet published upon this occasion, President Charles B. Nolte says:

"Research is misunderstood by a great many people, but in its simplest form it may be defined as an organized and diligent application of existing knowledge to unearth new facts. . . . Crane Co., therefore, is dedicated to the philosophy that only through continuing a well-organized program of research can it best serve its employees, its stockholders, the users of its products, and society in general."

TRANSLATING RESEARCH INTO DOLLARS FOR YOU

Crane research has as its objective the saving of dollars in your plant operation—the improvement of those valves and fittings whose responsibility it is to control all phases of flow.

Research in design and in new alloys has resulted in multiplying the life of valve stems—this improvement translated into longer life means dollars for you. Valve seats have greater resistance to erosion and corrosion because of research—and again research cuts your costs—saves you money.

Alloys have been developed capable of withstanding the searing cold of 150 degrees below zero—the scorching heat of 1300 degrees above, opening up new fields for you in the handling of liquids or gases at greater ranges in temperature. And in welding new alloys, Crane research has developed new techniques that make their use practical. Again this means increased production—more dollars in profit for you.

But research does not stop with these spectacular achievements . . . it also provides an accurate control of manufacture that guarantees the uniform, high quality of the valves and fittings you buy from Crane.

CRANE

CRANE CO., GENERAL OFFICES
836 S. MICHIGAN AVE., CHICAGO

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

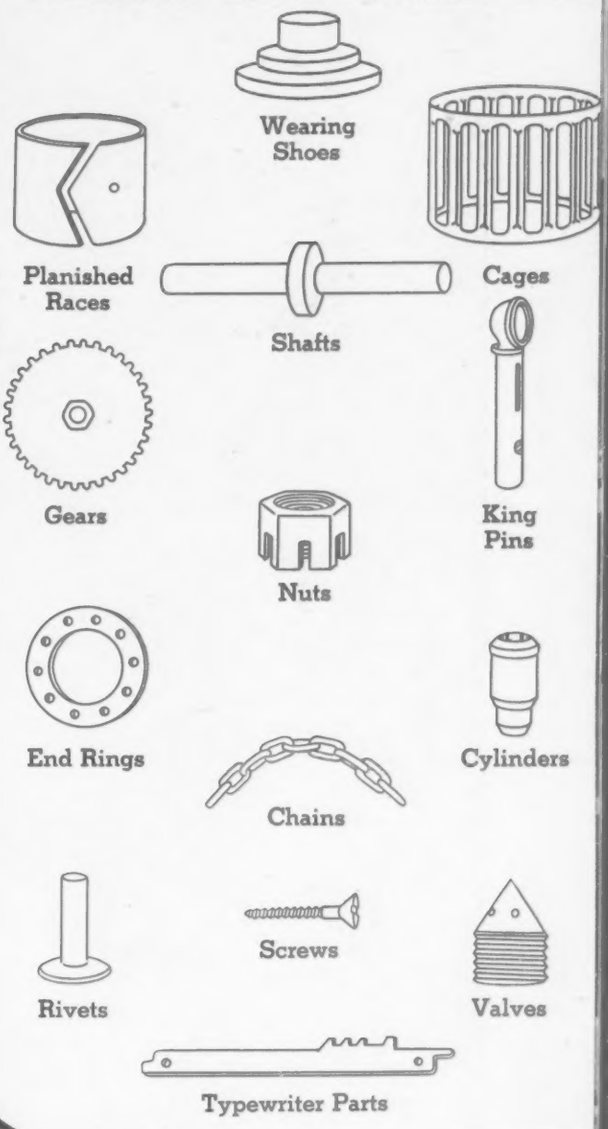
To Avoid Distortion
use the new *Ni-Carb* process
PATENTED
for surface hardening

Assembly costs are sometimes exorbitant because of the high percentage of parts which have warped in hardening. By "Ni-Carbing" and slow cooling (quenching can be omitted) a hard surface is obtained and warping and size change are reduced to a minimum. "Ni-Carb" is being adopted for this reason and many others such as:

1. A tough hard case which adheres very tightly to the core and has no tendency for exfoliation.
2. "Ni-Carb" can be used on any grade of steel, steel castings, cast iron and malleable iron.
3. The extent to which the process can be varied to meet specific requirements.
4. Economy in processing.

Send us a sample of your work for a demonstration.

"NI-CARB" IS APPLICABLE TO



AMERICAN GAS FURNACE CO.
ELIZABETH, N. J.

AMERICAN GAS FURNACE CO. PIONEERS IN 1878 LEADERS TO-DAY

INVESTIGATE THESE ECONOMY FEATURES:

1 Built-in Arc Watchman
2 Voltage fluctuations do not alter current
3 Pre-set single dial current control
4 Current does not change when machine heats up
5 Safe—lowest open circuit voltage
6 Improved method of Polarity Reversal
7 New accuracy and speed in overhead welding. A generator designed only for arc welding
8 Elimination of parts that require excessive maintenance
9 Armored construction
10 Unlimited number of current steps

THIS SIMPLIFIED WAY

The fewer controls a welding machine has—the less the time the operator spends in adjusting. And the less that is left for guesswork.

In the Flexarc welder, complete regulation of the current for any type of welding job, is reduced to a single control. Set it for the current required, and it's ready to go to work. And it will stay at the setting even after the machine heats up.

Let the Flexarc welder bring you these triple savings:

1 It gets more welding done per day, saves time in adjusting controls, and in chasing back and forth from the business end of the cable to the machine.

2 It eliminates the nuisance gadgets that require excessive maintenance.

3 It stabilizes current and deposits more metal per hour.

A new booklet—"Westinghouse Cuts the Knots in Arc Welding" is yours for the asking. Send for a copy today.

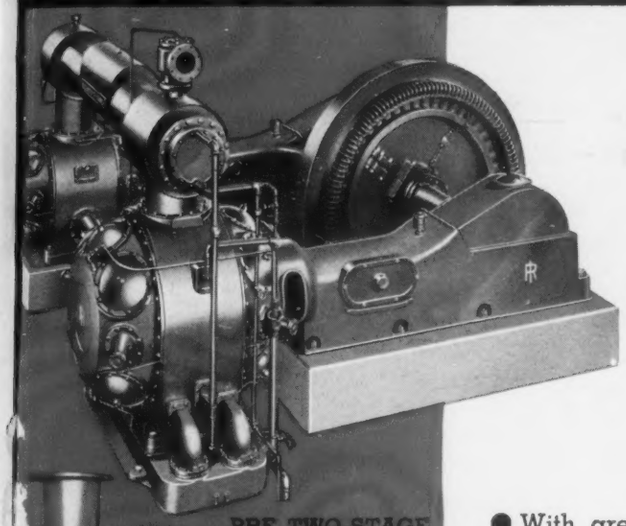
WESTINGHOUSE ELEC. & MFG. COMPANY
EAST PITTSBURGH, PA.

J20644

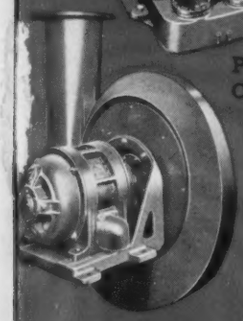
Westinghouse Flexarc

W WESTINGHOUSE ELECTRIC

Modern Compressed Air and Hydraulic Machinery That Will Help You *Reduce Costs in 1939*

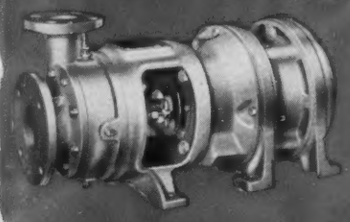


PRE TWO-STAGE COMPRESSOR

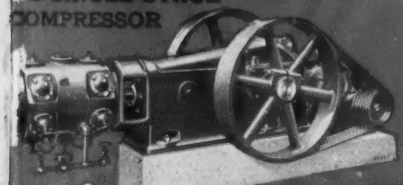


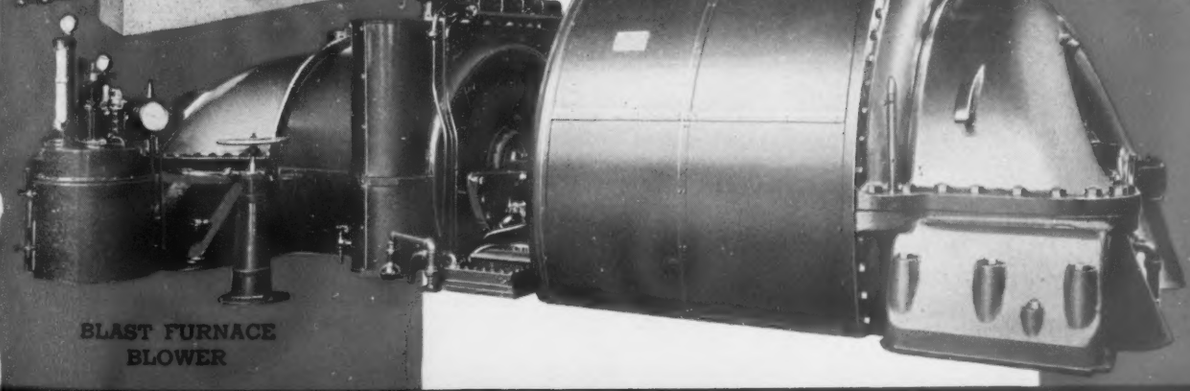
CUPOLA BLOWER

MOTOR PUMP

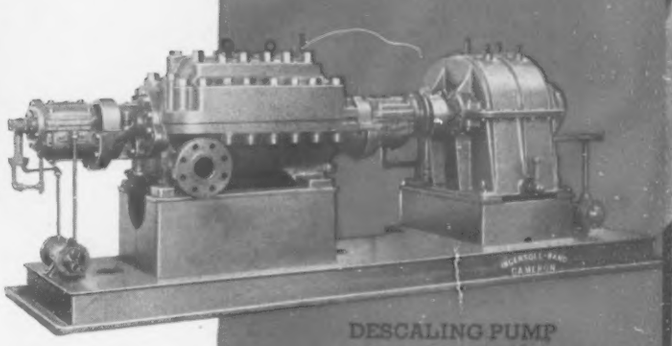


SINGLE-STAGE COMPRESSOR





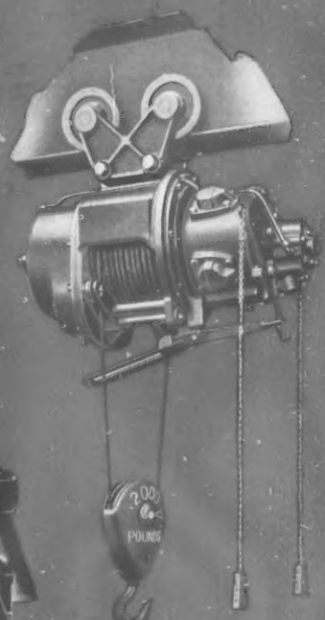
BLAST FURNACE BLOWER



DESCALING PUMP

BILLET-CHIPPER

HAND-HELD GRINDER



AIR MOTOR HOIST

● With greater production forecast for all phases of the metal industry, increased attention will be given to plant modernization which is often the key to more efficient production.

Each of the Ingersoll-Rand machines shown on this page is well qualified to contribute to the economy and reliability of your production setup.

Ingersoll Rand specialists have had much experience with a wide variety of machine applications. Their advice is yours for the asking.

The company's interest in an installation is continuous during the life of the machine. This is your assurance of efficient, reliable operation over a long period of years.

Atlanta
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How to finish ball races
FASTER... MORE ACCURATELY

Easy! **SAY USERS OF GRINDING WHEELS BY CARBORUNDUM**

● Faster production! Greater precision! Bearing manufacturers will tell you that they get both when they use wheels by Carborundum. That's because Carborundum can always provide exactly the right wheel to meet the requirements of each job. And when once the right wheel for a given job has been established, dependable duplication may be expected on future shipments. Exact technical control of all raw materials and methods of manufacture insures the same grain, grit size, grade and structure. And the same fast cutting action which makes production figures zoom and gives you greater precision on every piece you turn out. Whatever your grinding operation Carborundum abrasive engineers will be glad to survey your plant and help solve any grinding or finishing problem that may confront you. Write our nearest office for a representative.

CARBORUNDUM
REG. U.S. BRAND PAT. OFF.
ABRASIVE PRODUCTS

THE CARBORUNDUM COMPANY • NIAGARA FALLS, N.Y.

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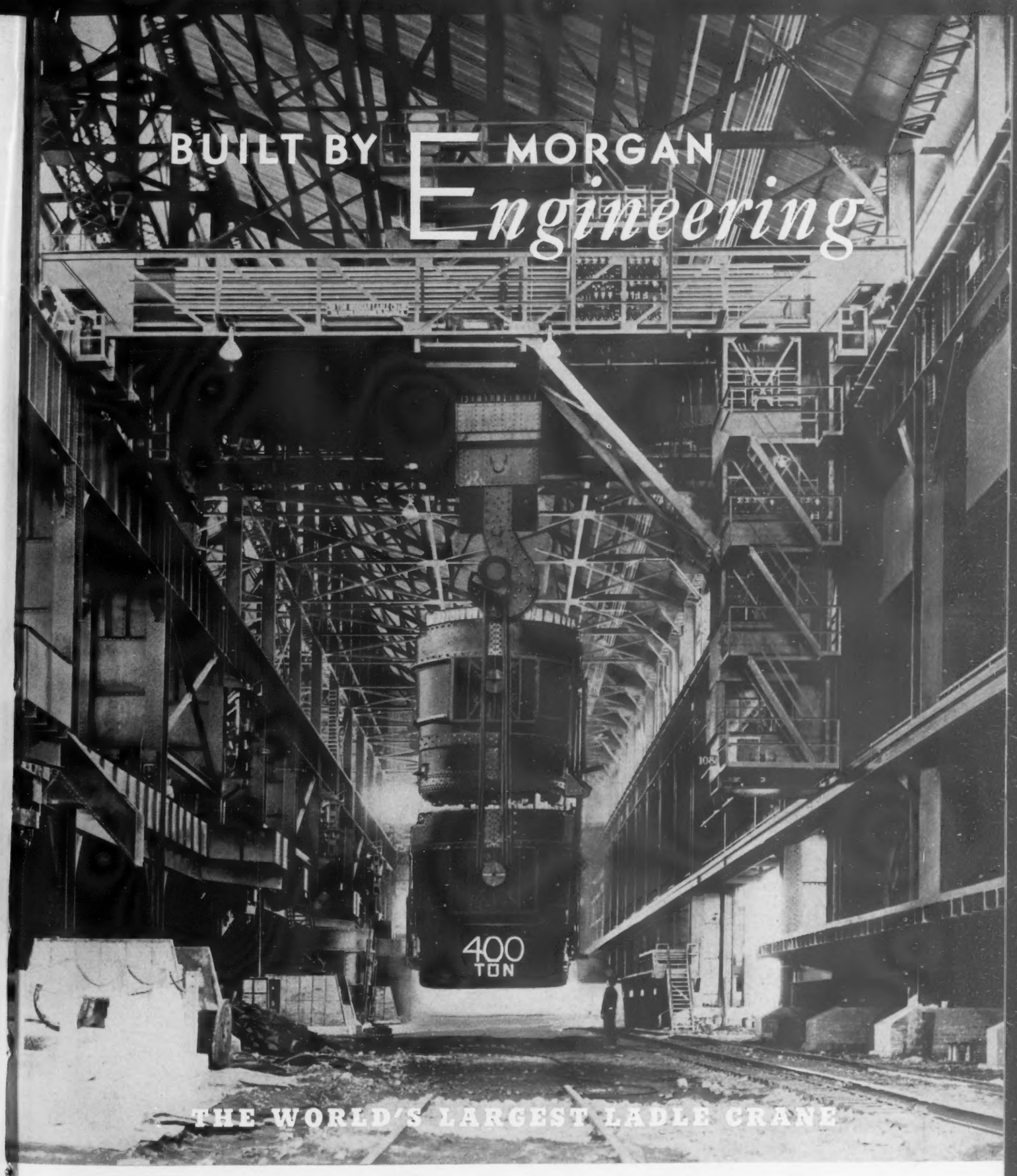
Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum is a registered trade-mark of The Carborundum Company)



THE WORLD'S LARGEST LADLE CRANE

● Here is shown a 300-ton, 60′-0″ span, 4-girder type ladle crane handling a test load of 400 tons. Equipped with worm-operated trolleys and anti-friction bearings, it also has incorporated every known safety feature.

Morgan engineers, pioneer builders of heavy duty steel mill cranes, are ever alert to accept the newest proved advances in ladle crane construction.

So widely known is this fact in the steel industry that the name of Morgan Engineering has become synonymous with such equipment in virtually every plant of every large producer of steel.

★

DESIGNERS • MANUFACTURERS • CONTRACTORS

BLOOMING MILLS • PLATE MILLS • STRUCTURAL MILLS

★ ELECTRIC TRAVELING CRANES • CHARGING MACHINES

INGOT STRIPPING MACHINES • SOAKING PIT CRANES

★ ELECTRIC WELDED FABRICATION • LADLE CRANES

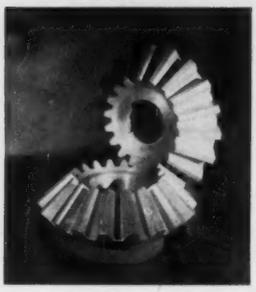
STEAM HAMMERS • STEAM HYDRAULIC FORGING

★ PRESSES • SPECIAL MACHINERY FOR STEEL MILLS

THE MORGAN ENGINEERING CO., Alliance, Ohio

Pittsburgh, 1420 Oliver Building

★



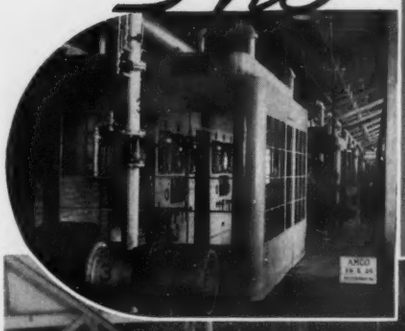
STEEL GEARS NELOY

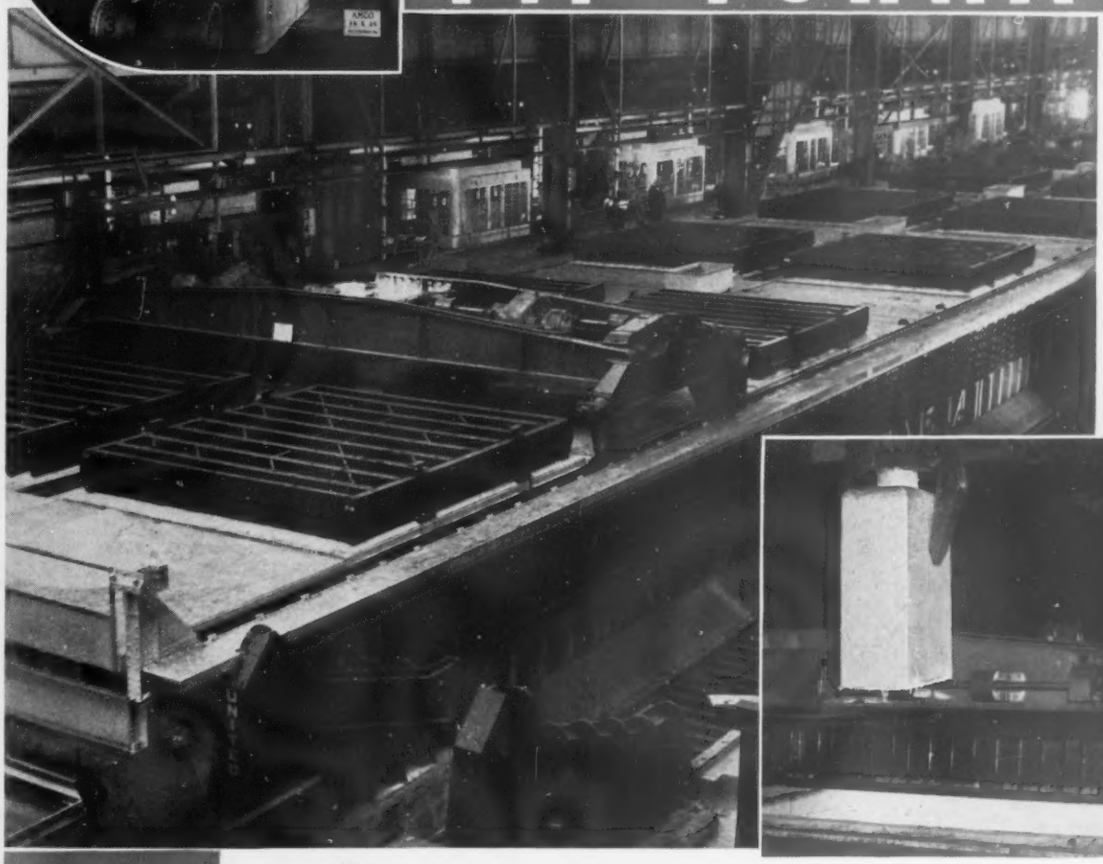
NELOY

NE stands for the National-Erie Corporation, a self-contained industrial nucleus that manufactures carbon and electric steel castings, spur, bevel, mitre, and sykes herringbone gearing; also special machinery of all kinds. Specializing in NELOY, a remarkably hard and strong alloy steel, the corporation provides every modern facility for economical and practical production on a precision basis. The plant, all under one management and operating on one site, contains: pattern shops, open-hearth and electric steel foundries, machine shops, gear-cutting department, heat-treating plant and complete metallurgical laboratory. Their watchword is uniformity and reliable service — plus economy.

NATIONAL-ERIE CORP.
ERIE · PENNSYLVANIA

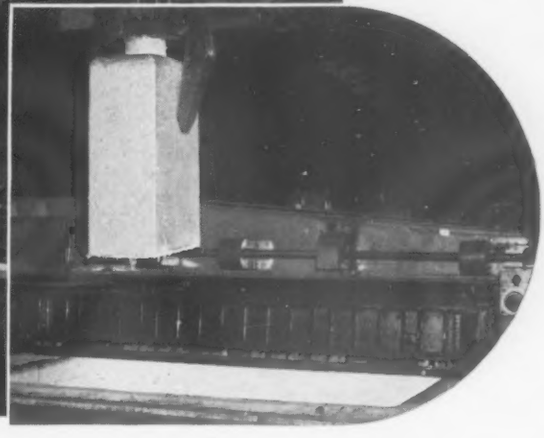
The AMCO PIT FURNACE





Upper Left—One of a battery of instrument control houses

Left — General view of 16-pit installation



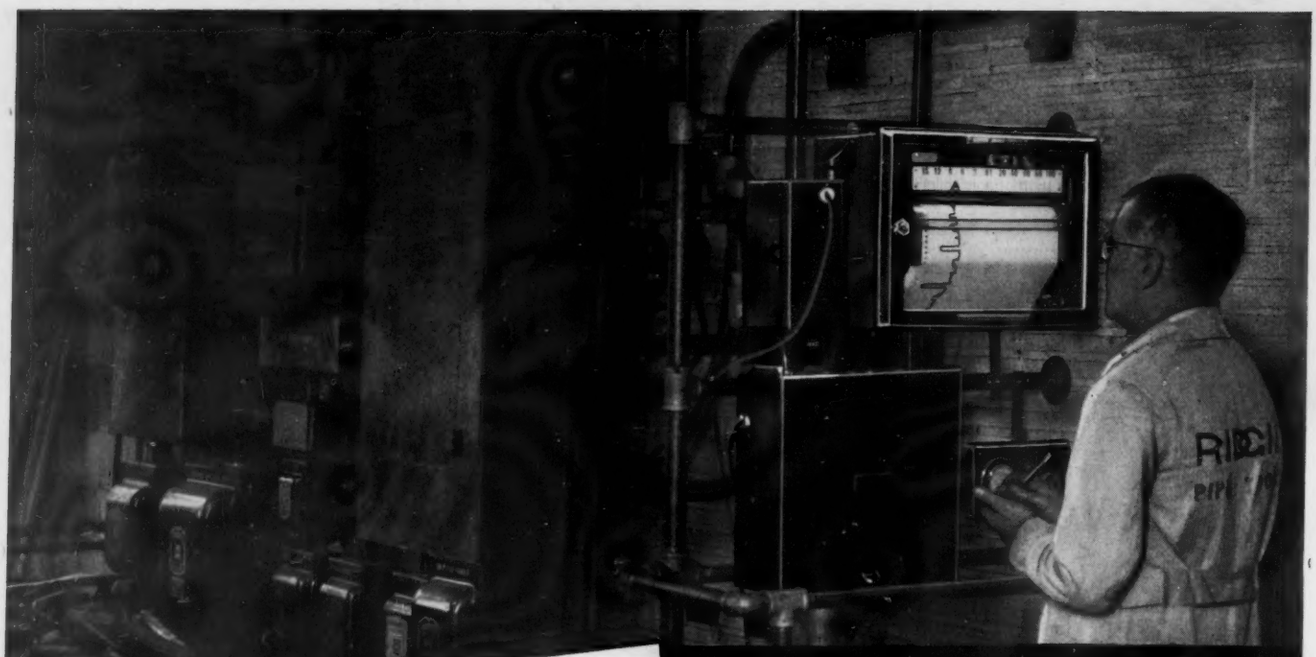
- INCREASES PRODUCTION
- IMPROVES QUALITY
- LOWERS COST

RECENT OPERATING REPORTS SHOW:

Substantial increase in steel quality
Substantial decrease in chipping costs
40% to 50% reduction in Scale Loss
40% to 50% reduction in Fuel Costs
40% to 50% reduction in Maintenance Cost

Total Savings Amortize the Investment in Approximately 2½ to 3 years!

The AMSLER-MORTON COMPANY
FULTON BUILDING • PITTSBURGH, PA.



minimizes scaling and de-carburization

The Ridge Tool Company

MANUFACTURERS TRADE RIDID MARK

PIPE TOOLS "LONGRIP" EXTRACTORS

CABLE ADDRESS RIDGETOOL ELYRIA OHIO ALL CODES USED

Elyria, Ohio

4/12/38

The Brown Instrument Company,
Philadelphia, Pa.

Gentlemen:

Recently we installed a Brown Analy-Graph in our Heat-Treating Department on two of our controlled atmosphere furnaces.

The instrument was in operation only a short while when we discovered from the erratic curve record on the chart, that the atmosphere in one of these furnaces was very unsteady. Upon investigation, we found that this was due to two causes -- first, the furnace had developed serious leakage, and second, the vent was not properly located. By repacking the furnace and relocating the vent, we have completely eliminated this condition.

The Analy-Graph enables us to place complete confidence in our heat-treating department. Now we know, exactly and at all times, the conditions under which our cutter blades, our vise jaws, our wrench jaws or our chasers, are hardened.

We have used the Analy-Graph for eight months -- we would not think of operating without it now.

Yours very truly,

THE RIDGE TOOL COMPANY

W. O. Thewes, Supt.

WOT:MP

The Brown ANALY-GRAPH records the slightest variation in furnace atmospheres, whatever the cause — whether combustion is complete or incomplete. The metallurgist or furnace operator can change the atmosphere specifications at any time to suit the metal and work in hand. He has positive assurance, in advance, that the heat treatment will produce exactly the desired characteristics regardless of day, time, weather or season of year.

The Brown ANALY-GRAPH effectively aids the heat treater to produce clean, properly treated work at the lowest possible cost. Write for Bulletin 92-1. THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4462 Wayne Avenue, Philadelphia, Pa. Offices in all principal cities. Toronto, Canada: 117 Peter Street—Amsterdam-C, Holland: Wijdesteeg 4 — London, England: 70 St. Thomas' St., S.E. 1.

BROWN INSTRUMENTS — INDUSTRIAL

FURNACE ATMOSPHERE

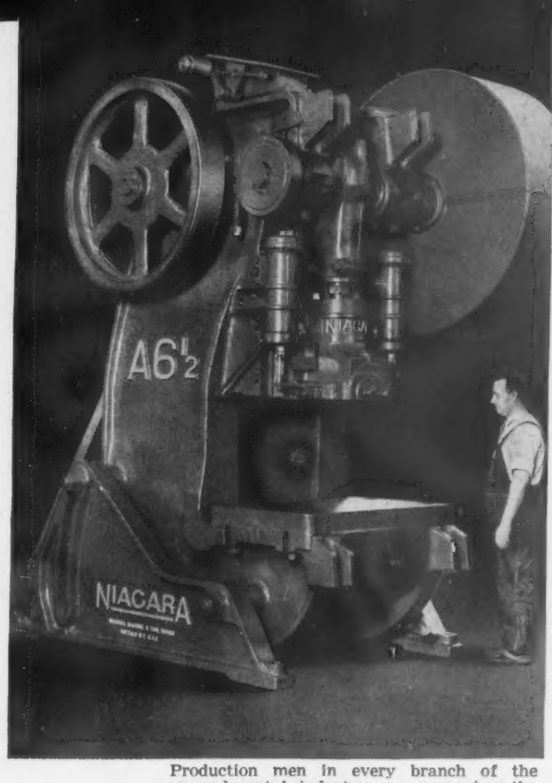
BROWN ANALY-GRAPH RECORDER

To Measure and Control is to Economize

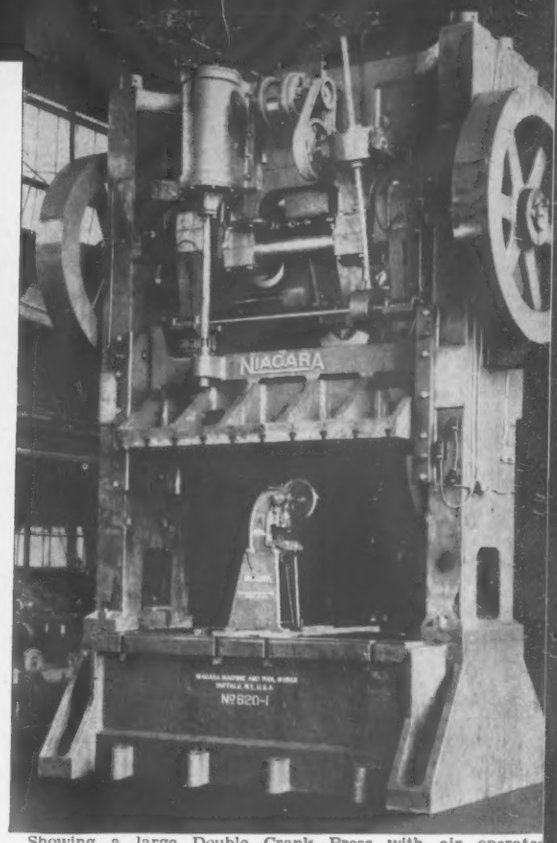
60 years experience

BUILT INTO NIAGARA PRESSES, SHEARS AND MACHINES

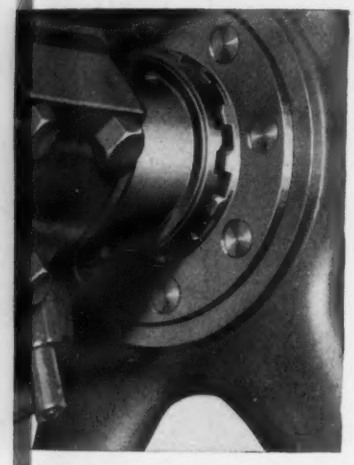
THE proof of a machine is in the using. New and exclusive developments, strength, rigidity, more strokes per hour, convenient, safe operation— those are a few results of 60 years of Niagara engineering that hard boiled production men are welcoming with open arms. Write for bulletins showing latest developments in Presses, Shears, and Machines for shearing, blanking, drawing and forming plate and sheet metal.



Production men in every branch of the pressed metal industry are approving the advanced engineering in Niagara Presses. It is responsible for increased production and lower costs.

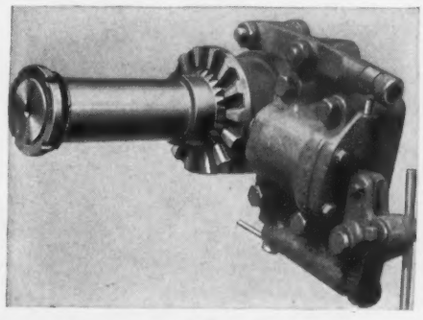


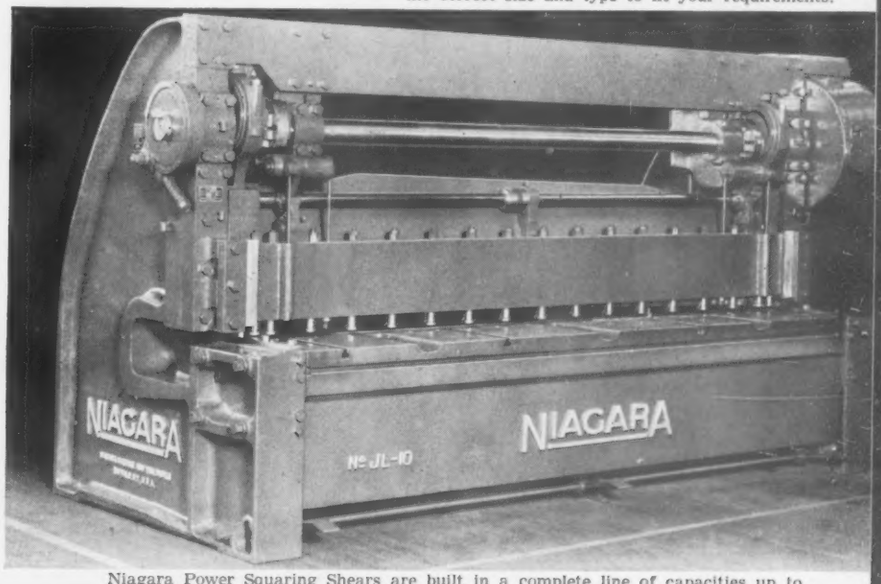
Showing a large Double Crank Press with air operated friction clutch and a small inclinable press with sleeve clutch, illustrating how the complete Niagara line provides the correct size and type to fit your requirements.



Niagara Sleeve Clutch with Built-in Single Stroke

Patented Niagara 14 point engagement Sleeve Clutch gives instant engagement, more strokes per hour, long life and safety. An exclusive feature of Niagara Presses and Shears.





Niagara Power Squaring Shears are built in a complete line of capacities up to ¾-inch plate. Write for Bulletins.

NIAGARA

NIAGARA MACHINE AND TOOL WORKS, BUFFALO, N. Y.

Branches: Leader Building, Cleveland; General Motors Building, Detroit; 50 Church Street, New York

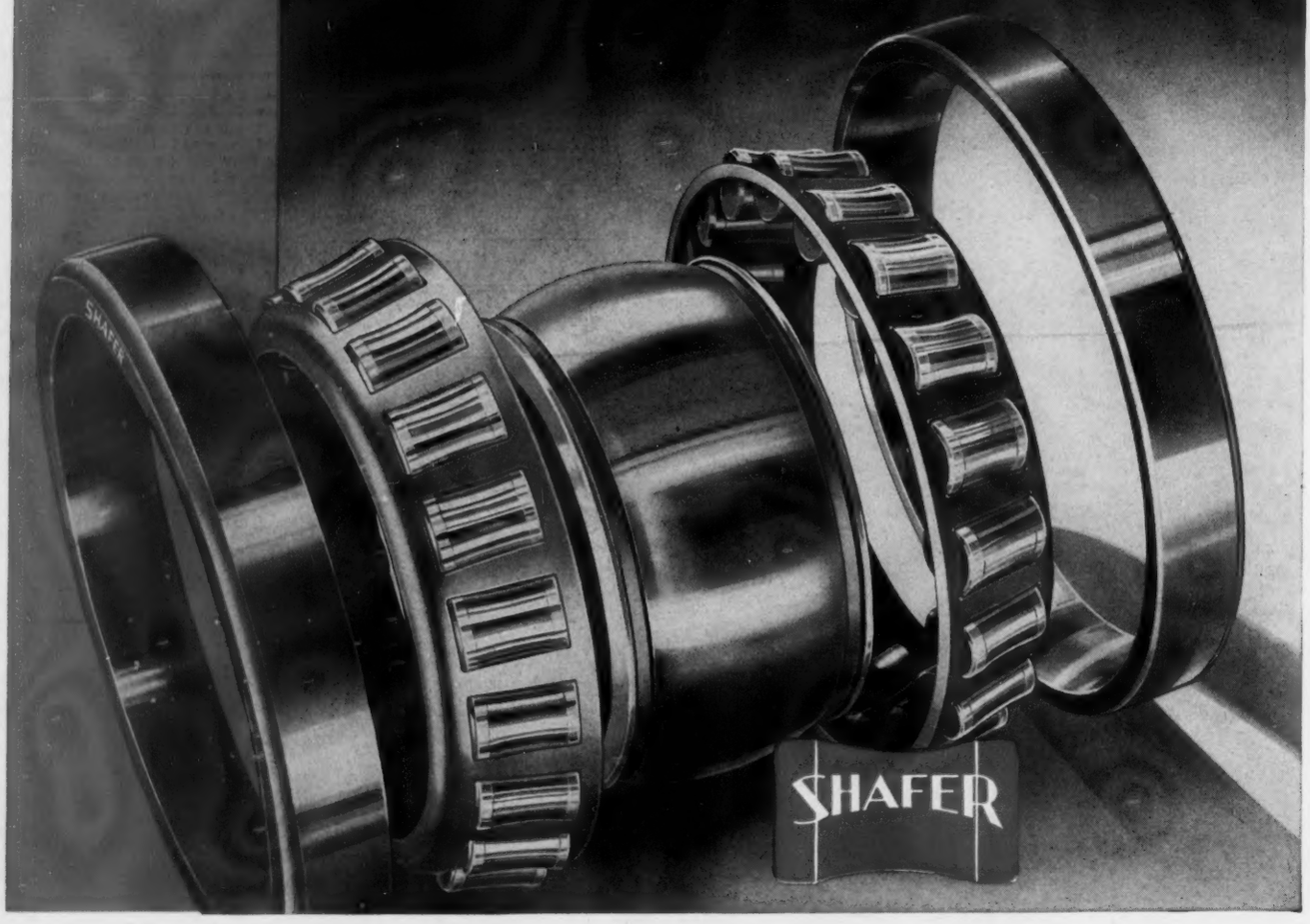
ONLY SHAFER BEARINGS

offer this effective self-alignment within the bearing itself. The inner race is a true spherical element, free to move without altering the contact of the CONCAVE rollers. Efficient bearing operation is maintained under all conditions. Only Shafer design combines: 1. Integral self-alignment; 2. Capacity for radial, thrust, or combined radial-thrust loads; 3. Simple adjustability.

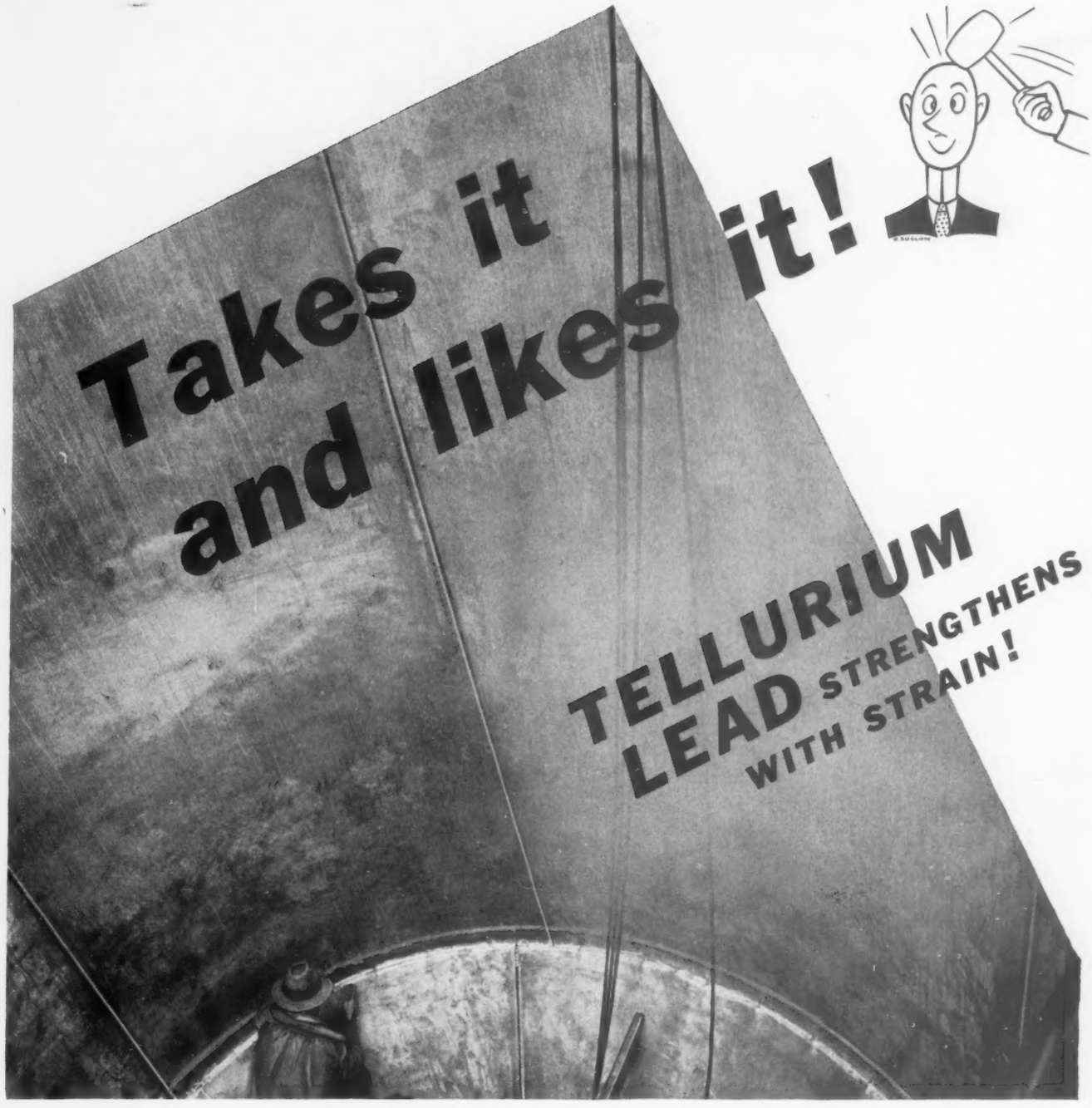
Available in a full range of sizes: Pillow Blocks Flange Units • Take-up Units • Cartridge Units Hanger Boxes • Flange-Cartridge Units • Duplex Units • Conveyor Rolls • Radial-thrust Roller Bearings

Write for Catalog 14 for complete information

SHAFER BEARING CORPORATION
35 East Wacker Drive • Chicago, Illinois



SELF-ALIGNING ROLLER BEARINGS



Every knock is a boost — to Tellurium Lead. This lead thrives on punishment — actually develops increased toughness under stress. *It work-hardens.* When rolled, hammered or stretched, it actually becomes stronger. As a result, turnover points and joints are less subject to cracking.

Furthermore, where vibration occurs, this capacity to develop latent strength minimizes buckling and creeping. And when heat changes are frequent and rapid, Tellurium Lead gives improved resistance to fracture.

The other outstanding advantage of Tellurium Lead is this: It gives increased resistance to sulphuric and other corrosive acids, even at temperatures that tend to approach the melting point of the metal. In plant after plant, it has prolonged the useful life of equipment . . . and reduced the number of shut-downs for repairs.

Tellurium Lead of our manufacture is time-tried St. Joe chemical lead alloyed with a small quantity of tellurium. It gives the advantage of this well-known chemical lead plus important new ones. Yet now, it costs only a fraction of a cent more per pound than chemical lead. Available in sheets, pipe and coils. For further facts, write to nearest branch.

Typical User Reports

"I wish to say that your Tellurium Lead pipe has proved all you claimed. It is easy to weld and easy to flange. Also the flanges stand up a good deal better than ordinary lead as they seem to actually become stronger at the turn-over point."

Another company writes: "We lined one of our tubs with your Tellurium sheet lead. After eight months, the lining shows very little if any corrosion due to the action of the 10% boiling sulphuric acid. It promises to have a much longer useful life than the lead previously used."

NATIONAL LEAD COMPANY

New York, Baltimore, Buffalo, Chicago, Cleveland, Cincinnati, St. Louis; National-Boston Lead Co., Boston; John T. Lewis & Bros. Co., Philadelphia; National Lead & Oil Co., Pittsburgh; Georgia Lead Works, Atlanta; The Canada Metal Company, Ltd., Toronto, Montreal, Winnipeg and Vancouver.

It's New!

351 ILLUSTRATIONS
374 PAGES — 6 x 9

Here is a new and practical 374-page book on modern grinding and polishing practice and theory.

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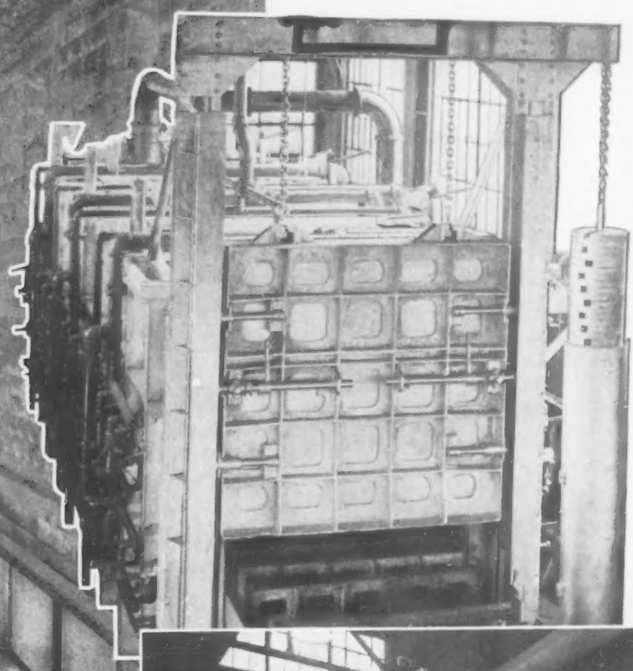
LEFT: *Interior of large car-bottom furnace installed at the Wycoff Steel Company, Chicago. 10,000 straights of Armstrong's Insulating Fire Brick assure maximum operating efficiency.*

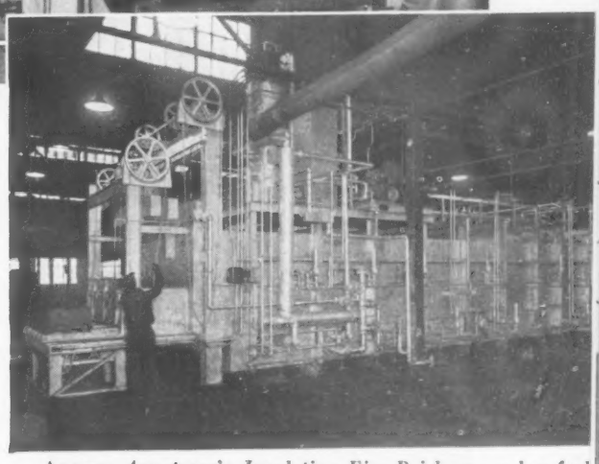
BELOW: *Exterior view of same furnace.*



SURFACE COMBUSTION

builds high insulating efficiency into these modern furnaces

with ARMSTRONG'S BRICK



ABOVE: *Armstrong's Insulating Fire Brick assure low fuel costs and operating efficiency in this continuous radiant tube controlled atmosphere malleableizing furnace at the Jamestown Malleable Iron Corp., Jamestown, N. Y.*

SURFACE Combustion Corporation of Toledo, Ohio, is one of many leading furnace manufacturers who build maximum insulating efficiency into their equipment with Armstrong's Insulating Fire Brick.

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10. Stocks available in principal cities
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ABOVE: *Large car-bottom furnace for railroad car side frames and bolsters at the Pittsburgh Steel Foundry Company, Pittsburgh, Pa. Furnace is insulated for maximum efficiency and economy with Armstrong's Insulating Fire Brick.*

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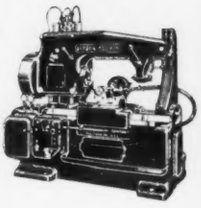

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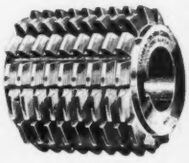

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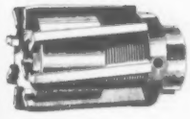

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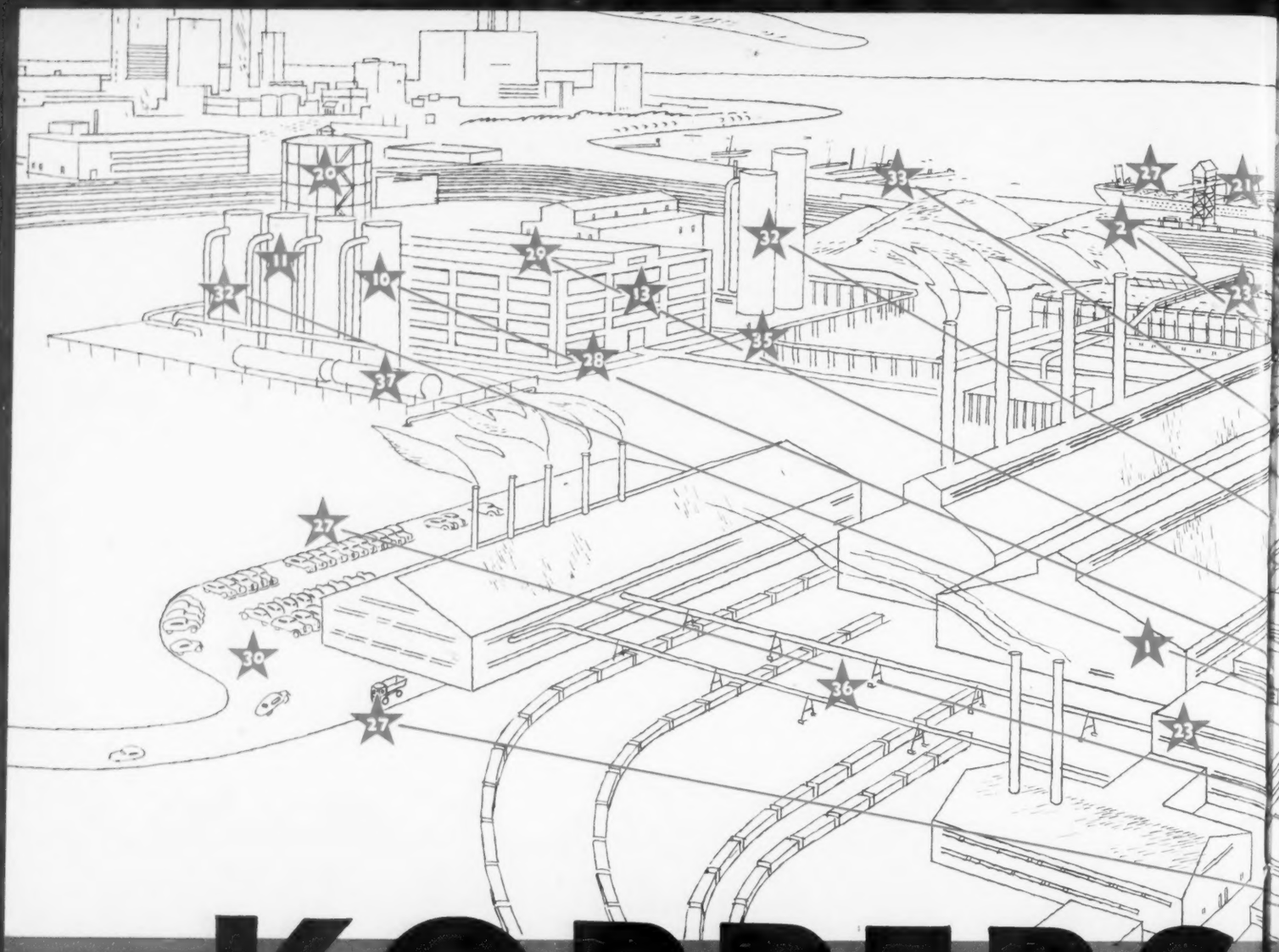

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Reduction in Area—per cent	12
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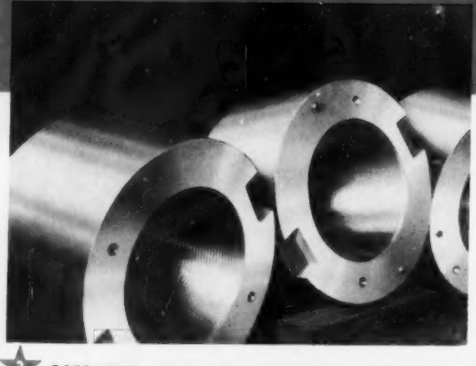
Permanent set under 100,000 per square inch	.020

(Note: Recommended for applications where lineal contact speeds do not exceed 250 ft. per minute.)



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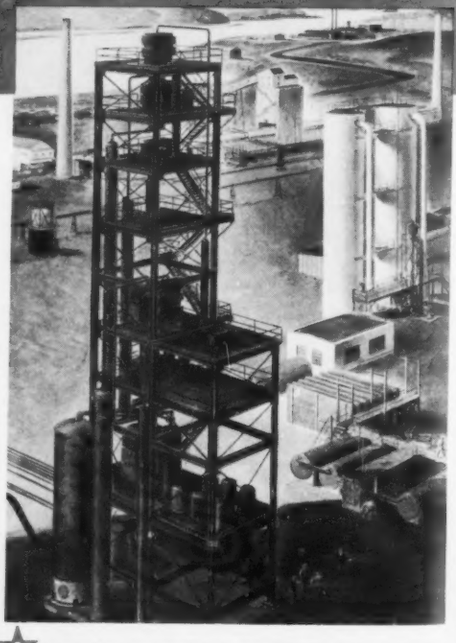

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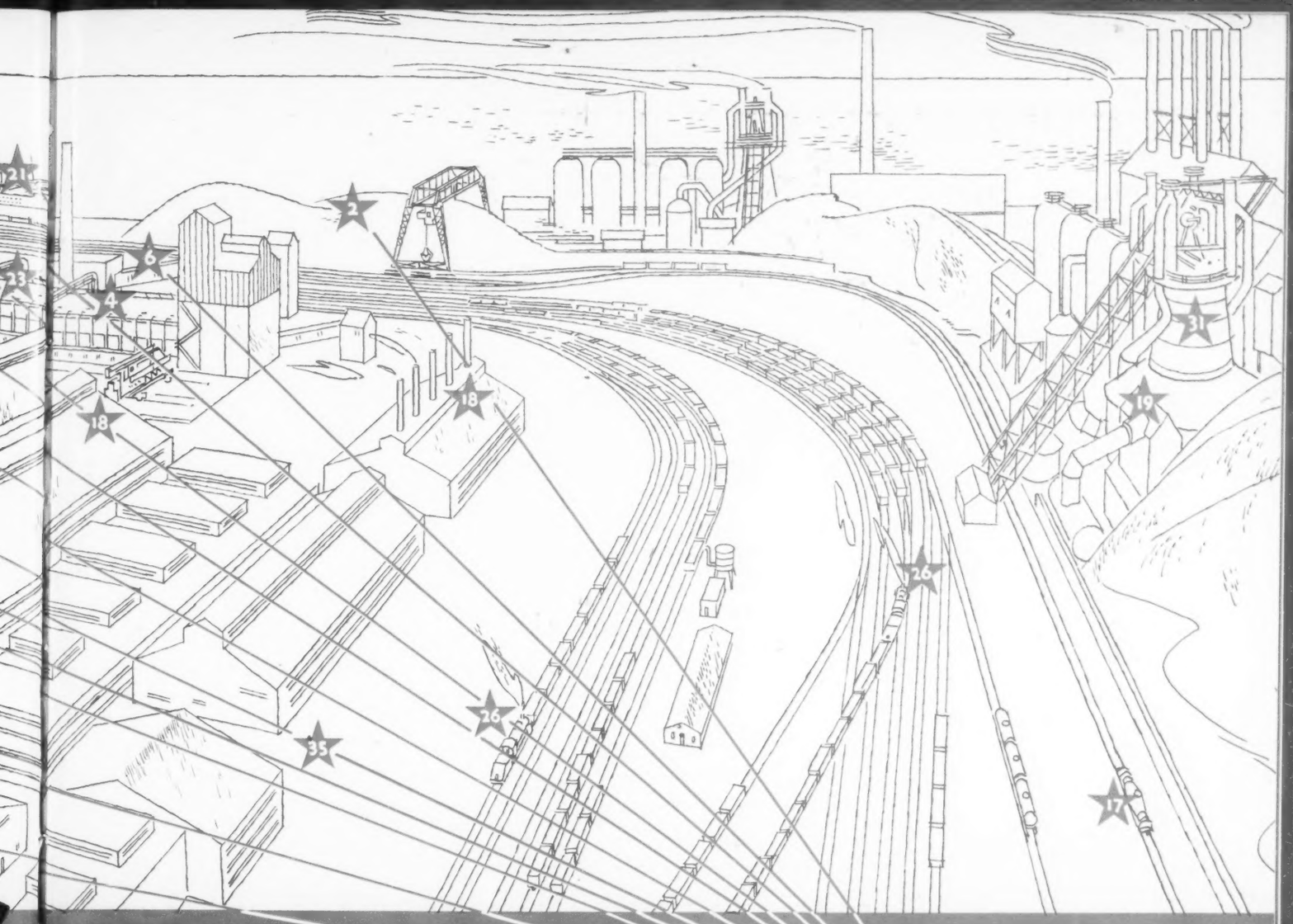

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5 Water Gas and Producer Gas Plants
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9 Liquid Purification
10 Phenol Removal Plants
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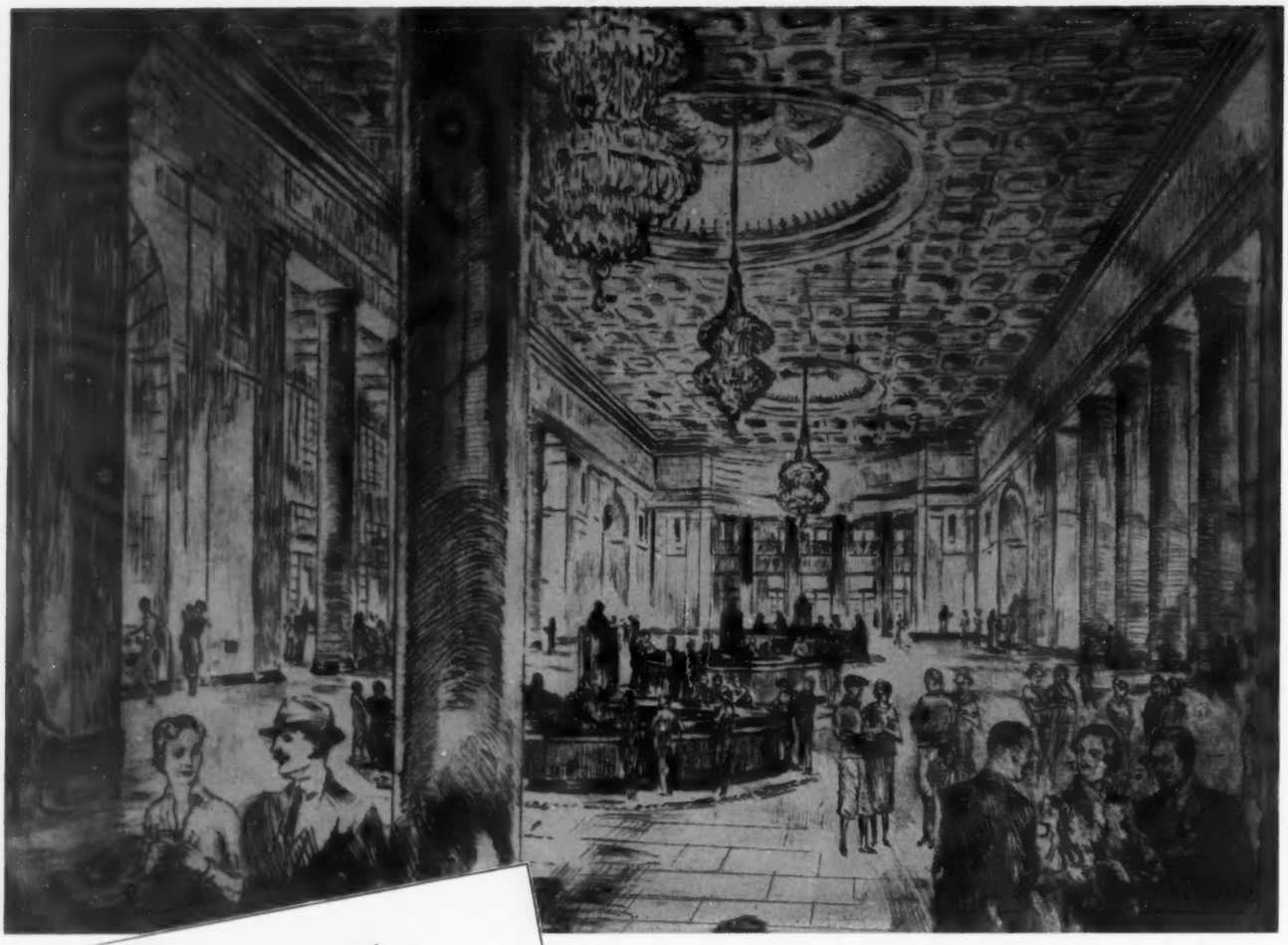

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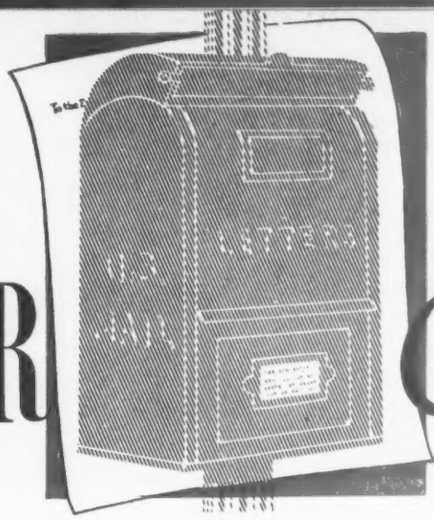


READER Comments

Readers are invited to comment upon articles, editorials, reports, prices or other editorial material appearing in STEEL. The editors cannot publish unsigned communications, but at their discretion may permit a writer to use a pseudonym when a bona fide reason exists for withholding his identity. Letters should be brief—preferably not exceeding 250 words.

Opposes Profit Regulation

To the Editor:

There are three ways in which private industry can share its profits: The first and proper way to distribute profits is to give them to the people who have invested their money in the business. A second plan would be to distribute at least some of the profits to the employes. A third, and at the present time a most popular plan, is to turn over the profits to the government.

I am very definitely of the opinion that so far as privately owned and operated industry is concerned the distribution of profits should not be regulated or influenced by a senate committee or any other governmental body.

I am wondering just exactly what is meant by the word "profit." Our industrial corporations represent nothing more than a way of making a living. They represent the modern way of doing productive work through co-operative effort and specialization. We should all understand that, by and large, there is no net profit in industry. The record shows that over a period of time, and taking in all privately financed business enterprises, the gains have been fully offset by losses, after allowing for what our unthinking politicians call a "decent standard of living" for those engaged in said enterprises.

I hope that STEEL will not place itself in the position where it appears to accept the principle that under our republican form of government government officials have any right to interfere with the rights of citizens to own property, or the rights of citizens to work as, when and where they please, so long as they do not trespass on the rights of others.

JEROME R. GEORGE

President
Aetna-Standard Engineering Co.,
Youngstown, O.

Where Profit Sharing Failed

To the Editor:

An experience with employe profit sharing may be of interest now when efforts are under way to broaden application of such plans. In a company with which I was connected several years ago another executive and myself received a bonus in addition to salary. This was based on net profits after an allowance for stockholders.

Later this plan was extended to cover all engineers and executives. This worked so well that bonus payments based on profits were provided for all employes, including men in the shops.

After a few years of smooth working we came to a year when volume of business and number of shop employes were about the same as in other years but profits were much lower. I think profits that year were only about one-third those of the previous year, the lowest since the general bonus plan had been in effect.

This sharp drop in bonus benefits resulted in so much confusion and dissatisfaction that the distribution of bonus payments to shop employes and clerical help in the office had to be discontinued.

The subject of compensation to employes is large and difficult because of the human factor and the relentless time factor, which so few people understand.

MIDWEST ENGINEER

Pittsburgh

Who Pays the Taxes?

To the Editor:

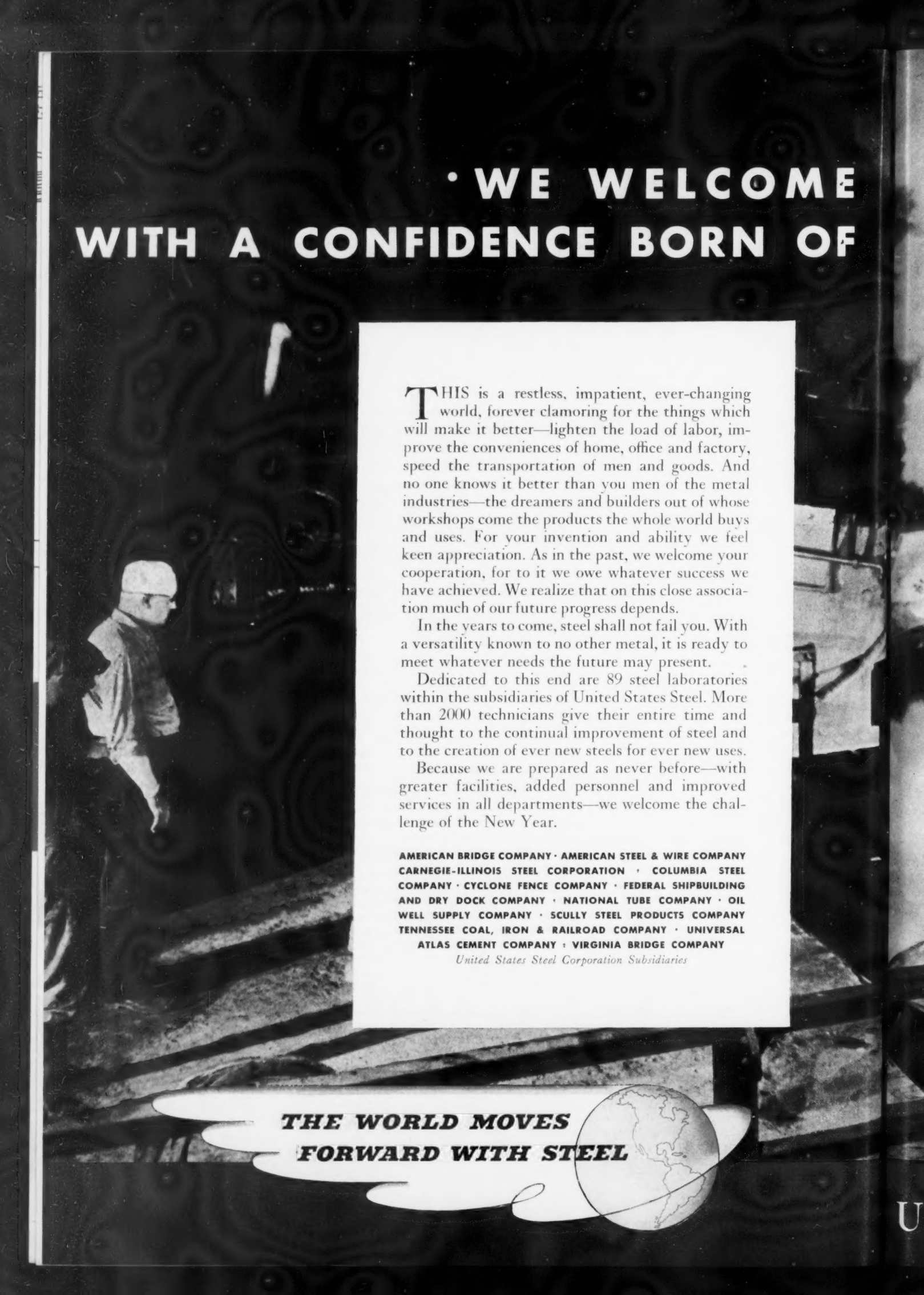
Taxes! Taxes! Every business man is talking about his tax problem. Yet no one actually knows the present tax burden on trade or industry. It is well known that the tax load on business has grown heavier in recent years, that taxes frequently absorb a large part of potential profits. Nevertheless, business men do not know which industries carry the heaviest burden; whether taxes bear most heavily on small, medium or large concerns; or how much tax is federal, how much state and local.

A nation-wide survey now being made by Dun & Bradstreet Inc., will yield answers to these questions in addition to continuing last year's survey of business trends, estimates of 1938 sales volume in various trades and industries, and inventory investment at the close of the year. Is business forging ahead, holding its own or slipping backwards? Have sales improved as much during 1938 as is generally reported? Are inventories being depleted or are warehouses and shelves still overstocked?

The results of this survey will be published as soon as the research and statistical division of Dun & Bradstreet can make them available. Your readers are urged to cooperate in order that the data for this trade may be comprehensive and accurate. If they have mislaid their questionnaires, another copy will be furnished by the nearest Dun & Bradstreet office, or by writing direct to this magazine.

A. D. WHITESIDE

President,
Dun & Bradstreet Inc.,
New York.



THIS is a restless, impatient, ever-changing world, forever clamoring for the things which will make it better—lighten the load of labor, improve the conveniences of home, office and factory, speed the transportation of men and goods. And no one knows it better than you men of the metal industries—the dreamers and builders out of whose workshops come the products the whole world buys and uses. For your invention and ability we feel keen appreciation. As in the past, we welcome your cooperation, for to it we owe whatever success we have achieved. We realize that on this close association much of our future progress depends.

In the years to come, steel shall not fail you. With a versatility known to no other metal, it is ready to meet whatever needs the future may present.

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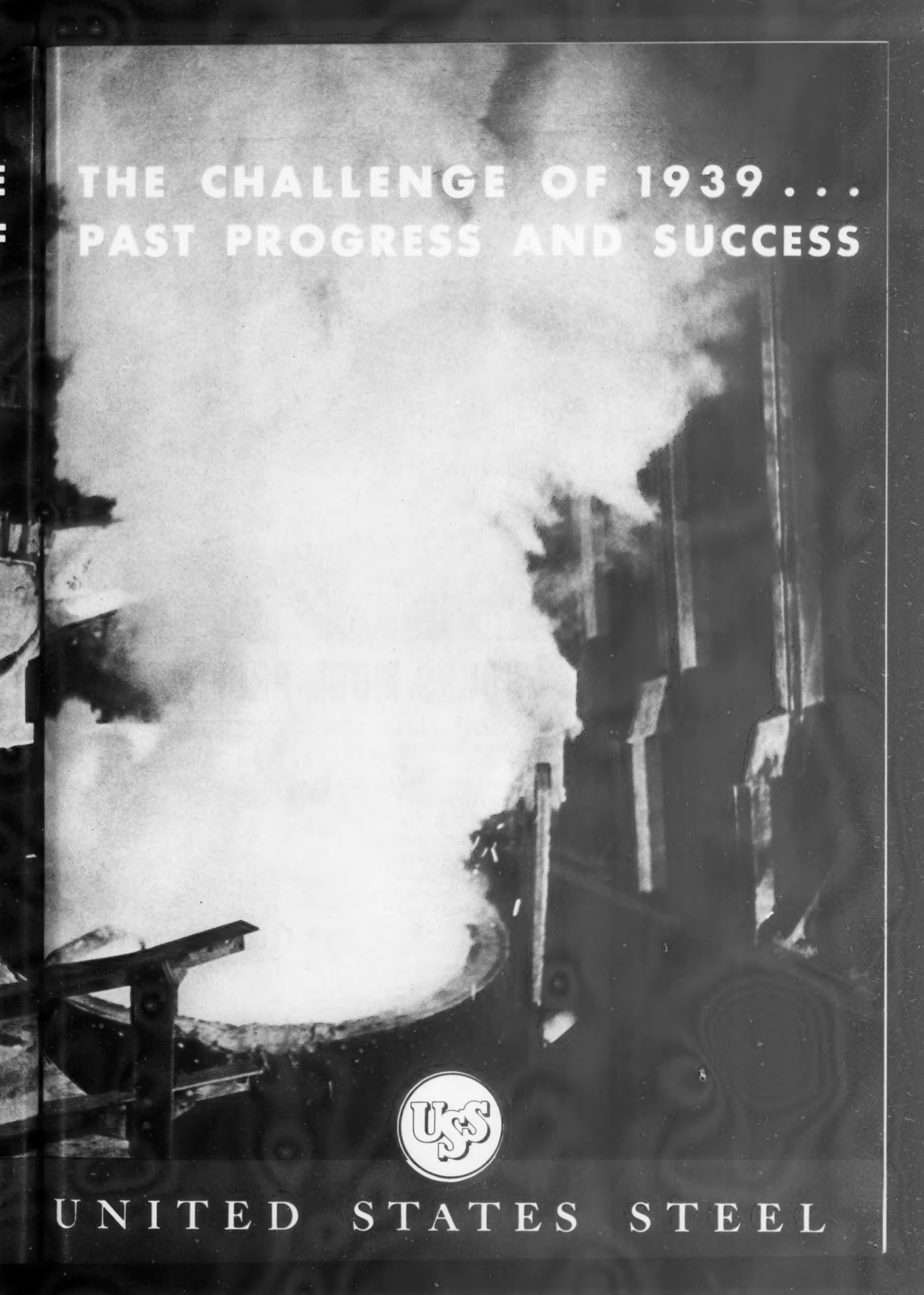
THE WORLD MOVES FORWARD WITH STEEL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In these days of established costs for labor and materials, you must make each man-hour on your cost sheet more productive to insure a reasonable margin of profit. Wise manufacturers are using P&H Cranes to simplify and speed the handling of materials through the manufacturing process—leaving men and machines free for more productive work. P&H Cranes can make each hour of the working day more profitable for you. They are built in sizes up to 300 tons, along with the complete P&H line of Trav-Lift Cranes (1 to 15 tons) and P&H Type R Hoists (1 to 15) tons. Since 1890 the Harnischfeger Corporation has been America's largest single source for overhead materials handling equipment cranes and hoists. Full information on request.

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STEEL

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January 2
1939

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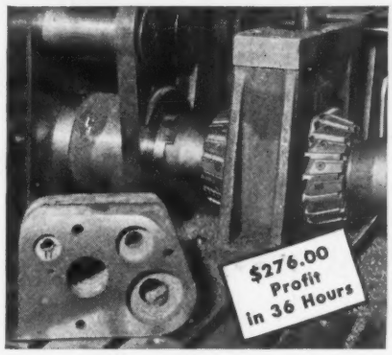
PRODUCTION · PROCESSING · DISTRIBUTION · USE

Here's Where You Can Use Carboloy for GREATER PROFITS IN 1939!

CARBOLOY TOOLS

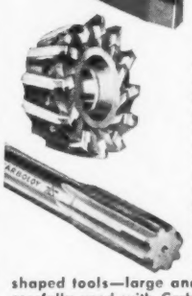


Here's an excellent example of the way Carboloy tools help to increase profit-margins. This job of milling cast iron valve bodies, using two Carboloy milling cutters, saves $276.00 every 36 hours.

STANDARD TOOLS

—standard styles of Carboloy single point tools in a wide range of sizes for all common turning, boring and facing operations. Catalog M-37.

SPECIAL TOOLS

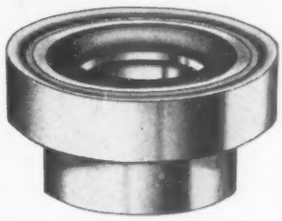


Carboloy is being widely applied on practically all types of tools in common use, including not only solid tools but all types of adjustable cutters. Milling cutters, reamers, boring tools, counterbores, combination counterbores and reamers, profiling tools, spotfacers, trepanning tools, spinning tools, forming and grooving tools—from the most simple types to the most intricately shaped tools—large and small—all are being successfully used with Carboloy tips.

GAGES

Carboloy tipped gages insure dependable accuracy over long periods of use. Reduce gage inspection time and substantially decrease scrap. Any gage can be tipped.

CARBOLOY DIES



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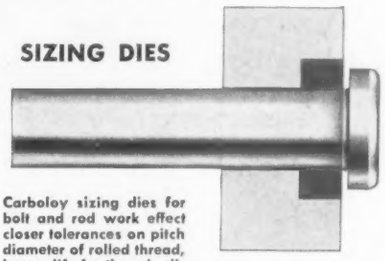

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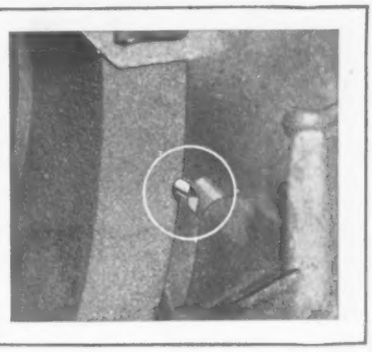

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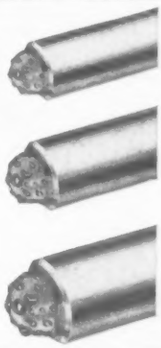

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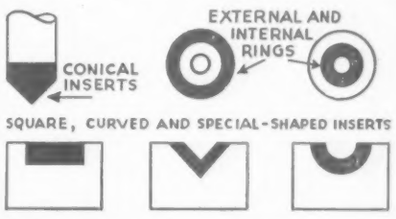

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AS THE EDITOR VIEWS THIS ISSUE

■ FROM the standpoint of business activity and volume, 1939 starts out under much more favorable conditions than those that prevailed a year ago. Current indications are that the continued rise in the business curve which characterized most of the last half, but which was interrupted by the usual holiday let-down, will be resumed shortly. Expectation is that the first half of 1939, from a volume standpoint, will be fully as good as the last half of 1938 and probably about 15 per cent better. Unfortunately, the year starts with price levels (p. 236) on a great many raw materials and manufactured products that return losses or insignificant profits. Unless profits are made on a larger scale, less impetus than desired will characterize industrial expansion.

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Industry finds it increasingly difficult to make a profit under the code of rules (p. 130) that now governs business. Under the new rules most cost elements, such as wages, hours, taxes and the like, are not within the control of management. But while costs thus are frozen, industry has little control of selling prices, and must sell in a highly competitive atmosphere, with governmental encouragement of prices at or below the level at which profits are possible. It is apparent that sweeping changes in the present rules must be made at Washington and state capitols before business can regain full health. Ironical is the fact that most of the new rules were conceived in the public interest. They have had a reverse effect, contributing additional unemployment and insecurity. . . . Due to the conservative trend that manifested itself in the November elections, industry can expect more favorable treatment from the next congress. The administration is expected to slow down on radical reform (p. 153); if it does not, such measures are expected to encounter resistance in congress. But the Washington outlook is not assured. If he wishes, the President easily can harass industry through existing governmental agencies.

Rules Cut Profits

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Outlook for the construction industry (p. 138) is bright. The public works program, including 6333 contracts awarded or to be let, will require about 1,000,000 tons of fabricated structural steel and a large tonnage of concrete reinforcing steel; at least two-thirds of this material will be rolled and fabricated in 1939. Residential construction is expected to rise 25 to 40 per cent, public utilities construction 20 per cent and industrial construction 30 per cent. Forecasters expect a slowing down about the middle of the year due to expected increases in cost in the form of higher wages to building trades workers. . . . Shipbuilding (p. 139) will consume more steel than in any year since the World war.

Million Tons In Building

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Current estimates in the automotive industry (p. 159) are that 1939 will be approximately a 3,500,000-car year, a gain of about 35 per cent over 1938. This industry, in common with many other industries, tends to formulate its policies with a view toward more regularization of employment, implying resistance to the quick upbuilding of production peaks. Decentralization of automobile production away from Detroit is expected to gather further momentum during 1939. . . . While no real approach yet has been made toward solving the problem of the railroads, these interests need a vast amount of equipment and materials. Current indications are that railroad purchases in 1939 (p. 141) will be considerably in excess of the 1938 volume.

Auto Outlook Up Sharply

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In the field of agricultural equipment some encouragement is seen (p. 144) in indications that farm prices have touched bottom and that further declines are not in store. And improved industrial activity is bound to increase the volume of business in farm products. Agricultural equipment sales should be as good in 1939 as in 1938 and tractor sales should be considerably larger. . . . Tin plate consumption (p. 147) con-

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fidently is expected to be considerably larger this year than last. Of interest is the fact that tin plate producers have departed from tradition by covering their customers' requirements only through the first quarter of 1939, leading to speculation as to whether the price is to be advanced. For the first time, production of cold-reduced tin plate last year exceeded that of the hot-reduced product.

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Oil and Gas To Expand

This year will bring the first major revival in oil and gas construction in more than a decade. Important expansion and modernization programs (p. 150) already have been announced by large companies. . . . The national defense program has not been revealed in all its implications. However, naval requirements this year (p. 151) will be large. Aircraft construction will be carried out on a large scale. The program is expected to involve purchase of large quantities of machine tools and other equipment. . . . This year will see an increase in buying of consumer goods. The outlook is promising for such products as electric refrigerators, washing machines, ironers, vacuum cleaners, electric ranges, radios and many others. An important new farm market is being created by the rural electrification program.

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Efficiency On Increase

While the country's No. 1 job is that of finding re-employment for our millions of idle workers, industry must face conditions realistically and cannot afford to contribute toward this objective on any basis other than that of efficient production. Technical and engineering progress has been rapid of late and many new developments are available for reducing costs and improving manufactured products in 1938. . . . A start has been made (p. 172) at forming parts by pressing iron powder into dies; bearings so formed, it is held, have greater load carrying capacity at higher temperatures and pressures.

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Better Heat Treating

The field of heat treating abounds with opportunities for improving products and reducing costs. There is a better understanding (p. 169) of mixed gases and controlled atmosphere operations, greater accuracy and reproductivity of results may be obtained. Latest gas carburizers automatically quench, wash and temper. New units make it possible to harden either the outside or inside diameter of a part, or locally harden or anneal any portion of a shaft. Great savings are possible through mechanization of heat treating operations. Economies are derived from the use of induction heating and the oxyacetylene flame.

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One of the ways in which manufacturers can lower such costs as still are controllable is in the full use of modern materials handling equipment. Handling and processing operations (p. 175) now can be combined to a degree hitherto unknown, with resulting important savings. In studying prospects for 1939, it becomes increasingly apparent that the wages-hours law is going to stimulate mechanization of materials handling in some sections of the country, as in the South, where manufacturers hitherto have not availed themselves fully of the latest equipment. . . . Many new developments are available in the field of joining. Vast progress has been made in making welding more versatile and in reducing its cost and improving its quality. Rivets are being cold-driven with many advantages. Many ingenious new fastening devices and methods are available.

Savings in Machinery

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Users of castings can benefit (p. 210) from recent progress in the foundry industry. . . . Important savings can be realized from improvements in stamping equipment (p. 189) and many additional parts now are being produced as stampings. . . . The forging industry, as a result of producing an engineered product (p. 190) looks forward to improved business in 1939. . . . New machine tools (p. 200) are more automatic and soon pay for themselves in production lines. . . . . Applications of die-castings (p. 208) are growing. . . . Many new developments (p. 204) permit better metal finishing. . . . The steel industry (p. 193) has available many ways of further reducing costs and controlling quality. . . . Centrifugal casting of steel gears (p. 169) is held to be an important advance in gear metallurgy.

All Lines Improved

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In entering 1939, manufacturers are keenly aware that real, sustained prosperity in this country will depend largely on what our legislators at Washington and elsewhere do with reference to business. Their chief concern should be the formulation of governmental policies that will stimulate free enterprise to the end that there again eventually will be a job for everyone able and willing to work. For this is the basic problem out of which all our other principal ills spring. Throughout the year 1939 manufacturers should concern themselves actively with politics.

Washington Holds Key

E C Kreutzberg

The Rules Have C

But B

■ STEEL and metalworking companies begin the new year under far more encouraging circumstances than existed 12 months ago.

Besides the fundamental need for rebuilding inventories, which has contributed greatly to the upswing in recent months, business has felt the stimulus of returning confidence.

It is interesting to note that just as the failure of certain important security flotations late in the summer of 1937 foreshadowed the business relapse that was to follow, so did the successful issues by certain large steel corporations last summer prove to be the forerunner of an upswing in sentiment.

Better confidence on this latter occasion had its roots principally in Washington. Despite the election of Senator Pepper in Florida, which in effect restored the domination of the White House over congress in the closing days of the session, and smoothed the way for the passage of the wages-hours bill, there had been a more conservative trend, and greater independence on the part of congress in its relationship with the administration.

Some Gains at Washington

True, the President, in addition to his wages-hours bill, obtained the kind of pump-priming legislation he desired, and he was successful in his drive for the passage of the O'Mahoney resolution setting up a committee for the investigation of monopoly and the concentration of economic power.

However, he was defeated on his reorganization plan and certain of his tax proposals; and, of course, while the proposal to spend more than $3,500,000,000 on work relief and public works was another severe jolt to the budget, it did have some encouraging aspects.

Revision by congress of the undistributed profits tax and capital gains levy was unquestionably gratifying to business and finance. The profits tax, which was instituted in 1936 as a device to force corporations to issue dividends which could be taxed in the income of stockholders, had been universally condemned by business spokesmen as hindering the accumulation of corporate funds for plant expansion, debt retirement and reserves. Congress at its last session removed the tax entirely from small and debt-burdened companies and left only a 2½ per cent differential on the undistributed profits of large corporations.

The capital gains tax, first effective in 1913, but amended in 1934 so that losses on capital could be deducted only within strict limits, had been attacked by taxpayers as unfair and as tending to freeze the badly needed flow of capital into enterprise and industry. Hence, as a concession, congress consented to a one-year carryover of losses to offset short-term gains, and gave taxpayers the option of a flat rate of 15 per cent on long-term gains instead of counting a proportion of the gains as regular income. However, the New Deal principle in both of these taxes remains.

The subsequent improvement in steel business in the last half became accelerated, particularly with the passing of the European war scare in late September. The automotive industry made a delayed-buying spurt, and November elections added stimulus. New orders later eased off, but activity at the close hovered around the high point of the year.

Throughout the year there was an element of spottiness, and industrial improvement and expansion lagged. Corporate financing was largely for refunding, far from impressive, and there was more of a disposition to borrow from the banks than to issue bonds, as corporations were still none too sure of the investment market with respect to industrial offerings. Even bank loans were disappointing to many, considering the better pace of general business.

Business Borrowing Increases

Commenting to STEEL on this and other points pertaining to the trend in commercial loans, a large eastern banker said:

"With business generally showing gradual improvement since early summer and more recently, a marked recovery, there has been widespread disappointment in the failure of business loans to increase. That the business recovery has been so rapid with little expansion of bank credit is disappointing on the surface. However, closer analysis of the various factors involved throw a somewhat different light on the subject. Actually, business borrowings have increased considerably more than is indicated by the figures shown for commercial, industrial and agri-

e Changed

ut Business Marches On!

cultural loans by the reporting member banks in 101 cities.

"As pointed out in the New York federal reserve bank's November review of business and credit conditions, corporations have refunded bank loans in the new issues' market to the extent of at least $160,000,000 during the period from June through October. The bulk of these had been held by the member banks in New York city which since the low point in August have experienced practically no change in business loans. Reporting banks in the other 100 cities, however, have shown an increase of $60,000,000 in loans for this period, so that total business borrowings have shown a rise of somewhere in the neighborhood of $200,000,000.

Working Capital Down

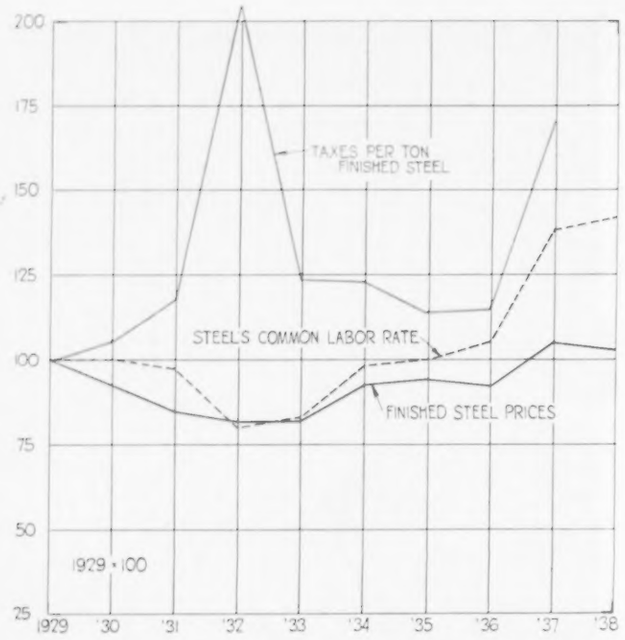
"A factor contributing to the failure of borrowings to increase more materially thus far in the business recovery has been the rather substantial realization of cash throughout the winter and early spring by corporations in the normal liquidation of inventories. Indications point rather strongly, however, to the probability that a sizable amount of this cash has been used in the replacement of inventories and that working capital of business generally is at a lower figure than at the beginning of the recovery movement.

"Of course, it is perfectly normal for loans to lag behind an upturn in business just as they frequently continue to increase several months after business activity has turned downward. A good example of this is that commercial loans showed practically a continuous expansion from $5,000,000,000 in the early part of 1936 to about $7,000,000,000 in October 1937, whereas business activity reached its peak in the spring of 1937.

"Given a continuation of the present business trend, therefore, it is not at all improbable that bank loans will show a contra-seasonal movement such as that which took place during the winter of 1936 and the spring of 1937."

Corporate financing for the first ten months, 1938, totaled $1,682,911,441, compared with $2,331,170,188 in the corresponding period of 1937, which was the lowest since 1934.

In this figure for ten months last year, $921,190,639



■ **Something for critics of the steel industry to think about—the course of finished steel prices, common labor rates and taxes per ton of finished steel since 1929**

represented refunding and $761,720,802 new capital. This latter compared with $1,144,962,511 in the preceding year, and $887,667,283 in 1936, but was better than in 1935.

While the outlook in steel generally is more cheerful than a year ago, profits have been, and continue, disappointing to producers, despite the present substantial rate of operations. For the first three quarters, 1938, the steel industry showed a loss of about $25,000,000 and probably will show a loss for the fourth quarter.

Costs Frozen at High Levels

Returns on the present relatively good rate of operations have once again revived the phrase "profitless prosperity." Through high taxes and the medium of various governmental controls, particularly bearing on labor, costs have become frozen at such high levels that a reasonable profit is short of impossible—in view of the constant pressure from Washington to keep selling prices down.

Many who express this view believe that even the NRA regulations were preferable to those which rule today. Under NRA, higher costs resulting from control over wages and hours were compensated for in some measure by price posting provisions.

Industrial and managerial controls today involve wages, hours, prices, competition, unemployment compensation, old age insurance, and collective bargaining, among the more important items; to say nothing of safety, health and sanitation laws, to which latter, naturally, all subscribe.

Laws establishing certain of these controls have long been on the books in one form or another, such notably as the well-known Sherman act of 1890 and the Clayton act of 1914, set up to prevent monopoly and price collusion, with the federal trade commission established in 1914 to make this legislation more effective.

But at no time has there been such a profusion of controls set up as in the past few years—controls which also have extended into most every ramification of finance, from corporate organization to control of the security markets, and direction and partial ownership of the country's banking system, on into the realm of managed currency.

Further, nearly 100 government corporations and agencies have been set up with vast powers of competition with private enterprise and investment in a number of fields, and many with their own special demands on business for exhaustive records and information.

It is not only the rising tide of these outside controls, but the complexity created by the confusing legal and administrative interpretations of them—controls often drawn up along broad lines and not infrequently all too hastily conceived. Many will be a long time in becoming fully clarified, it is believed. Even today, for instance, there is no all-embracing definition of what constitutes interstate commerce and intrastate commerce, fundamental points in the interpretation of many important regulatory measures. The individual answer frequently is dependent upon the facts in an individual case.

Significant is the statement of Calvert Magruder, general counsel, wage-hour division, department of labor:

"All I could do would be to issue a release setting forth our guess as to what most nearly defines interstate commerce as referred to in this statute. . . . We are working on some sort of a blanket interpretation, which will represent the opinion of this office, but it will be only our own definition and will have no official status under law."

Of all the government controls affecting industry, the Wagner labor act, passed in 1935, has had the most sweeping influence; and, barring the original AAA, it has of all the New Deal statutes occasioned the most litigation.

Ruled constitutional by the United States Supreme Court, it set up the right of workers to bargain collectively through representatives of their own choosing, and regardless of amendments which may eventually be made, the disposition of employers is to accept this as an established principle.

The act also established the principle of majority rule; in other words, that a majority of workers in a craft, plant or company, should represent all in bargaining with the management. It set up a list of "unfair labor practices" for the employers, but did not declare a single practice on the part of the labor unions to be unfair.

Brought Unparallelel Labor Strife

An employer must not refuse to bargain with a union which engages in sitdown strikes—although this question is now up before the Supreme Court—nor can he refuse to bargain with a representative even though he knows the representative to be irresponsible. He is not permitted to influence his employes in any way.

This act as interpreted by the labor board has caused unparalleled labor strife. In 1937, according to the international labor offices in Geneva, more strikes developed in the United States than in all other countries combined. During the past two years more than 42,000,000 days of employment were lost in this country due to strikes—to say nothing of time and money lost in negotiations and settlement of complaints which did not develop into the strike stage.

With the business recession labor became more

reasonable. The public has questioned an act that breeds so much discord, contributes to unemployment and distress. Opinion is growing that the law must be modified.

Seriously handicapped by one-sided legislation, industrial management has intensified its efforts along certain fundamental lines. It has endeavored to build good will with employes and the public.

Long before the New Deal was conceived many steel and metalworking companies had developed public and industrial relations to a high degree. But the rules have changed, and there has been a pressing need for a defense against radical influences.

One definite trend is the practice of management to interpret itself to employes, to acquaint them with mutual problems and responsibilities. Some start on this was made generations ago; today there are few well-managed companies where employes cannot learn truthfully the conditions surrounding their employment. Management is becoming more discerning, more aware of its own broad responsibilities.

Steel Stabilizes Employment

In recent analyses of employe problems that of security has appeared first on the list. Workers want high wages—always will press for them—but more important to the vast army of reliable employes is steady work, a feeling of confidence in their own life plans and actions.

This is the lead which employers are following today. While there are serious obstacles, nevertheless many are making headway. General Motors' wage guarantee is an outstanding example.

The steel industry itself has made noteworthy strides in stabilizing employment, as its frequently published records attest. A leading producer in discussing this general problem with STEEL, outlines his company's employment measures in two groups of principles. The first group deals with the situation when business is normal; and the second, with a policy designed to cushion declines. The first:

1. Every possible effort should be made to provide steady work.

2. Good wages should be maintained.

3. Good supervision should be provided throughout all plants of the corporation.

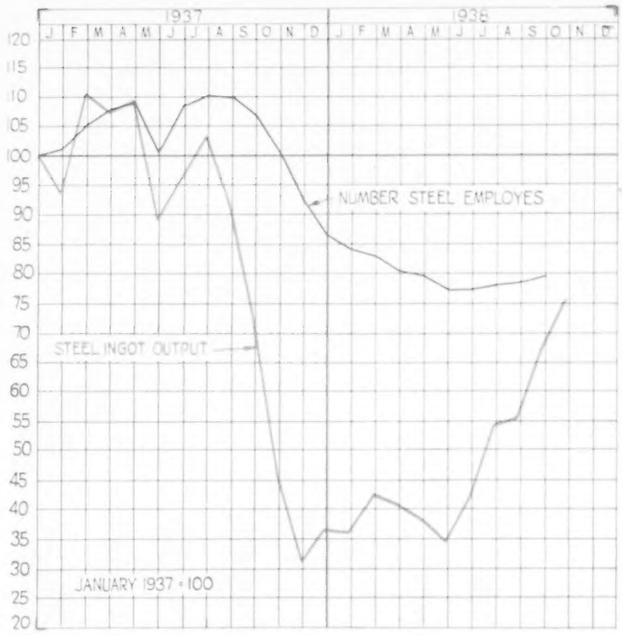
4. Good working conditions must prevail and the outstanding features under this heading are: Reasonable hours of work, protection of the health, provisions for safety.

5. The time of retirement should be anticipated, so that there be provided a plan for security in old age.

In the first of the foregoing items is included an effective employment bureau at each plant, handling transfers of men so that the labor force may show as little turnover as possible. This serves to avoid laying off personnel in one department while hiring new employes in another.

An effort is made to schedule work ahead on a normal basis as far as practical, and to maintain inventories of raw materials and equipment so that orders may be filled without sudden rushes and relapses. This includes reasonable production of semi-finished materials, against anticipated orders.

In cushioning the decline of employment under adverse business conditions the following principles



■ **Steel companies' employment policies preserved jobs for thousands of workers during the 1938 recession. Production fell sharply; total employment, comparatively moderately**

were adopted—after consulting with representatives of the employes:

First, the long-service men, those with families, and the most responsible and efficient workers will receive consideration as the active force, with the available work divided among them.

Second, the newer men and those less essential to current operations, and those with lesser dependency, will be placed on a waiting list, to be recalled as soon as work is available. A man on the waiting list still is an employe, has the same benefits and privileges as any other employe. Wholesale layoffs—or turning adrift—are avoided. Always there are some outright dismissals for lack of fitness—and in such instances the situation is clearly explained.

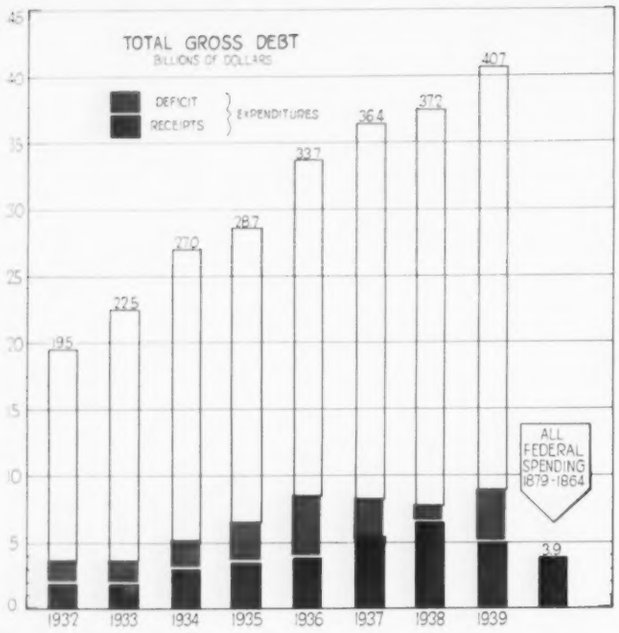
Throughout the metalworking industries, plans for spreading work and stabilizing employmnt have grown up by the scores since first impact of the depression, and the results of experience with such plans are likely to be far-reaching.

Restores NRA Controls

The relatively brief 4-page Walsh-Healey law is having a bearing on steel second only to the Wagner act. Effective Sept. 28, 1936, this act, officially known as the Public Contracts Act of 1936, in substance restored the wage and hour controls of the defunct NRA, without providing for any of the latitude of code days in price posting.

While the law applies to government purchases of more than $10,000, there are few in the industry who do not bid on government work, especially in view of the proportions this has assumed in recent years. Those who do not are affected through labor channels to meet the schedules of those who do. Hence, the effect of the law is widespread.

As for the working schedule of a maximum 8-hour day, or a 40-hour week, with time and a half for overtime, this is the same as under the code. It brought little if any change in schedules in the steel



■ **Estimated federal deficit for the fiscal year 1939 is $133,000,000 more than total federal expenditures from 1789 through 1864, from the Revolutionary war to the Civil war. Charted are federal receipts, expenditures, deficits and gross debt**

industry. However, the wage rates which have been proposed have not been accepted with equanimity.

The wage setup divided the country into only two sections, North and South, with 36 states and the District of Columbia comprising the North and taking a minimum wage rate for common labor of 62½ cents, and 12 states comprising the South, taking a rate of 45 cents. These were as high as the highest rates that were to be found, and even exceeded the highest in some districts, notably in the East. Even Philip Murray, SWOC chairman, had recommended only 60 cents for the East.

Arouses Storm of Protest

An action such as this, so plainly intended to force up wages, aroused a storm of protest, especially from the smaller companies, claiming it to be difficult or impossible to meet the government's requirements and compete with the large integrated, more favorably located companies.

They pointed out that one section of the act states contractors shall "pay not less than the minimum wages as determined by the secretary of labor to be the prevailing minimum wages for persons employed on similar work, or in particular, or similar industries or groups of industries, currently operating in the locality in which the materials, supplies, articles, or equipment are to be manufactured or furnished under said contract."

The secretary as administrator, may modify established minimum rates or working schedules "in the public interest or to prevent injustice and undue hardship." This appears to be the nearest approach to any provision in the law which would allow for a revision in the standards, in the event of a further depression, or a combination of conditions which would make them untenable.

This law has introduced a system of wage determination having little relation to factors of supply and demand, and which may serve as the opening wedge for further federal governmental regulation.

Until wage schedules are finally approved, this feature of the Walsh-Healey act remains inoperative. Thus to date there has applied only the time schedule, and such other features as relate to child labor, safety, sanitation and factory inspection laws.

The wages-hours law which became effective Oct. 24, last year, represented the second legislative attempt of the New Deal (the first being NIRA) to put a "floor" under wages and a "ceiling" over hours, for all industry.

With certain exceptions, it is illegal under this law for any employer engaged in interstate commerce to pay an employe less than 25 cents or employ him more than 44 hours a week, without time and a half for overtime. This applies to the first year of the law's operation. The second year the basic provisions will be 30 cents an hour and 42 hours a week, then for the following five years, 30 cents and 40 hours, and after that (eight years having elapsed), 40 cents and 40 hours.

With the minimum wage and maximum hour schedules now prevailing, these limitations have little bearing in the steel industry at present, although the regulation of time and a half for overtime as it applies to many groups of employes has and still is having its effect. Revisions, in fact, have been found necessary by many employers who have failed to realize that time and a half applies to various other classes of employes, and not alone to those in the minimum wage group; also that the 44-hour week was not, with the exception of one important rule, an "average" spread over a period of several months, as was the case in steel in the code days.

The exception to this later rule is where the time is averaged out under an arrangement established in collective bargaining, with the approval of the national labor relations board. Such agreement, however, may not provide for more than 1000 hours during any 26 consecutive weeks; or if employment is on an annual basis, 2000 hours during any 52 consecutive weeks.

In certain branches of the metalworking industry some basic adjustments are being made. This includes the machine tool industry, for which figures of the bureau of labor statistics in 1937 revealed an average of 44 hours a week, indicating some companies were working longer schedules. Rules continue to be handed down by Elmer F. Andrews, the administrator, with many questions yet to be answered.

Many Questions To Be Answered

Exempt under this law are bona fide executives, administrative and professional employes and outside salesmen. But the status of a substantial class of employes, including watchmen, maintenance men and elevator operators, is yet to be definitely established.

One clause which resulted in numerous wage reductions prior to its effective date, and in lesser degree since, is that "no provision of this act shall justify any employer in reducing a wage paid by him which is in excess of the applicable minimum wage under this act."

In many cases the hourly payment is well in excess of the minimum, but the weekly working schedule is longer than the law stipulates, and must be reduced or else continued with time and a half for overtime. To prevent costs from mounting as a result of either one of these changes, the disposition has been to keep the original working schedule, but reduce the

rate of pay sufficiently to provide the extra overtime cost. The law itself apparently provides no penalty for doing so.

Incidentally, despite this development and the contention that setting of wage minima tends to reduce wages in the higher brackets, the experience in the operation of various state labor laws is reported to be the reverse—wage levels having gone up instead of down. This has been true, it is said, in New York, Massachusetts, New Hampshire, Illinois, California and Ohio. A movement now is under way for enactment of state laws to give full effect to the wages and hours law in intrastate operations.

Appeals from the administrator's orders and complaints of violation of the law may be made only to federal courts. Incidentally, employes are subject to penalty if they accept terms of employment less than the standards established.

Steel Industry Little Affected

The Robinson-Patman act, in the more than two and a half years of its operation, has apparently resulted in no important changes in commercial practices in the steel industry. However, it has kept producers on the alert for interpretations which might affect them.

Enacted June 19, 1936, as an amendment to the Clayton act, this law was designed to abolish unfair discriminatory practices in interstate commerce, particularly as they affect prices.

These discriminations were formerly held unlawful only when they tended to create a monopoly or materially restrict competition in a particular field, but under the amendment they are unlawful if they result in unfair competitive injury to persons granting or receiving such discriminations, or to the customers of either.

Furthermore, beneficiaries of discriminatory practices, as well as the perpetrators, are subject to penalties. The burden of proving that there has been no discrimination in prices, services or facilities rests on the accused.

There are perhaps seven or eight major restrictions, but in this group fall many points which have and still are coming up for administrative and legal interpretations, much depending upon circumstances peculiar to specific cases. On the other hand, certain definite forms of price variation are exempt. Differentials may be made where they specifically reflect differences in cost of manufacture, sale or delivery of a product, resulting from varying methods and quantities involved. The federal trade commission may fix limits on quantity differentials, if it considers them discriminatory because available to too few customers.

Price concessions within the law include distress sales under court process or sales marking the discontinuance of business in the products involved. Also, a seller may select his own customers, selling to as few as he desires or exclusively to any one group.

The Robinson-Patman act has led steel sellers to scrutinize their methods closely, particularly cost accounting procedure. In the case of certain accounts, which might be challenged, sellers have set up separate books containing in minute detail all elements of costs and other pertinent information. Moreover, producers are more cautious in ascertaining whether buyers are entitled to certain differentials. But in general few changes in actual commercial practices are discernible to date.

Bans Unreasonably Low Prices

Unlawful practices include price discrimination between purchases of products of like grade and quality (presumed to mean where such purchasers are competitive); payment or acceptance of a commission except for service rendered; participation in a sale that discriminates against competitors of the purchaser by virtue of special discounts, rates, allowances or services (not specifically exempt under the law); and selling at unreasonably low prices for purposes of destroying competition or a competitor.

But much is subject to interpretations of the law, with some terms so vague as to cast doubt on their validity. A case in point, for instance, is what constitutes unreasonably low prices.

Concessions can be made to meet concessions of competitors, but caution is usually exercised in making sure that concessions by competitors have first been made.

Significant is the complaint of the trade commis-

■ **An industrial leader talks with his people: George M. Verity, chairman, American Rolling Mill Co., addressing one of the employes' "family meetings" in Middletown, O. Employers are trying to impress their communities with the benefits of understanding and co-operation**

sion against the Corn Products Refining Co. and its sales subsidiary, for alleged violation of the act. Discrimination against purchasers located at different delivery points is charged. Quoted delivery prices are the same in dollars and cents to customers located at any given point, but the complaint charges they are discriminatory among buyers located at diverse points.

These discriminations, the complaint alleges, may lessen substantially, or tend to destroy or injure, competition in the sale of corn products between the respondent companies and other manufacturers of such commodities, and also between buyers receiving the more favorable prices and those who do not. The commission also declares that when the company raises or lowers its prices, its competitors do likewise.

While it appears no direct reference was made to basing points, nevertheless an attack upon the system is seen in the complaint. Should the commission's charge stand, a principle might be set up whereby steel would have to be quoted strictly on an f.o.b. mill basis. Despite steps taken to eliminate steel basing point differentials at a number of points, the effect of such ruling, needless to say, would be sweeping.

Somewhat of a rarity in business legislation is the national law which a manufacturer may accept or reject. This is the Miller-Tydings act. It is a law whose sanctions the primary seller does not have to invoke, though one he has to watch, for the effect that its adoption by others may have on his competition. It is a law that resellers might very well be held responsible to, whether or not they wish to be, provided they desire to continue to sell the line of merchandise in question.

With its enactment in August, 1937, the federal government placed its stamp of approval on state fair trade laws which permit a manufacturer of trademarked or branded goods to enter into legal contracts with distributors for the maintenance of resale prices set by the manufacturer. It made lawful in interstate commerce practices which had been made lawful in intrastate commerce in many states.

Under this legislation the privileges of a manufacturer are extended. He may select his own customers, as before. While he had the right to establish conditions and prices under which his products were to be distributed, he now may make contracts enforceable in the courts. Previously when a buyer did not adhere to his suggested prices, his only recourse was to refuse to sell to him.

43 States Have Fair Trade Laws

A manufacturer entering into a contract with one distributor in a state may upon due notice make all other distributors adhere to the same terms, a provision which has been sustained by the Supreme Court.

Fair trade laws have been enacted by 43 states, the exceptions being Alabama, Delaware, Missouri, Texas, Vermont and the District of Columbia. Contracts may be extremely simple in form, with one form, if the manufacturer so desires, used in any one of the states having a fair trade law.

Needless to say, the Miller-Tydings act does not wholly repeal either the Sherman or federal trade commission acts and those who use its provisions to accomplish monopolistic restraints run the risk of antitrust proceedings. Manufacturers may enter into agreements with distributors for maintenance of resale prices on trade marked or branded goods, but they cannot enter into any pricing agreements with each other.

Acceptance of the law has been rather conservative, although increasing in recent months. More than 85 manufacturers in the hardware and affiliated lines have availed themselves of its provisions. Obviously an experiment, there has been a disposition to let others do the pioneering. Moreover, the opinion apparently has been quite general that initial costs would be heavy, and operations involving contracts with distributors in various states would be cumbersome.

Unquestionably some hesitancy has been due to fear of being placed in an unfavorable competitive position. Then, too, there has been the inherent dif-

(*Please turn to Page* 232)

Progress: Can It Be Stopped?

■ AMERICAN standards today contrast sharply with those of 1900. Population has increased almost 75 per cent. Conveniences then unknown have become commonplace. Buildings are higher, bridges are longer, airplanes no longer novel, almost every family has an automobile.

Have we reached the peak in national development? Can progress be stopped?

There remain to be built miles of elevated highways, 2,000,000 miles of dirt roads to be improved, 200,000 grade crossings to eliminate. Five million new homes are needed, 14,000,000 other homes require repairs.

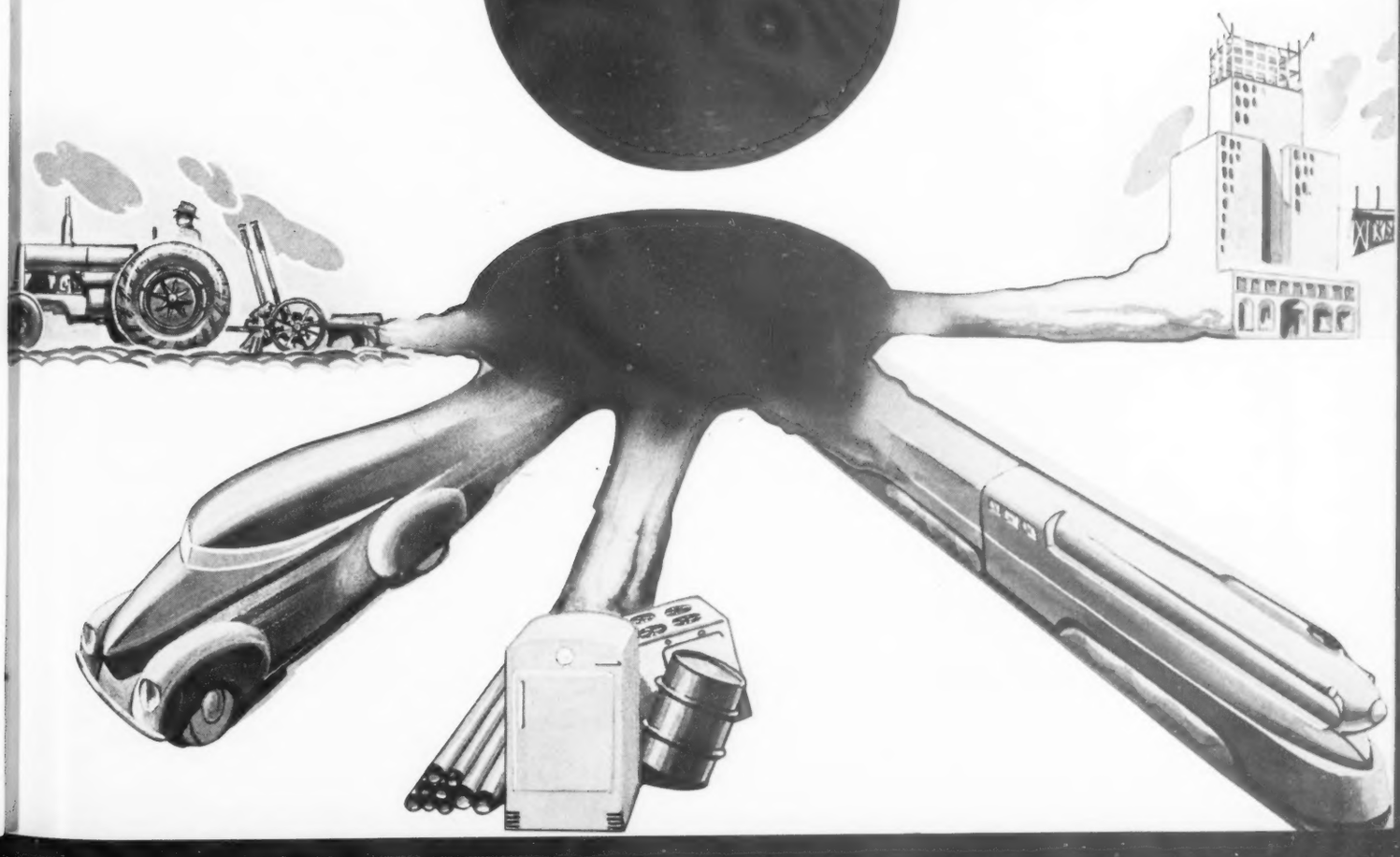
In many other fields tremendous actual needs exist. Railroads need a billion dollars worth of new equipment, sixty-five per cent of machine tools in use are obsolete. New inventions will create new industries.

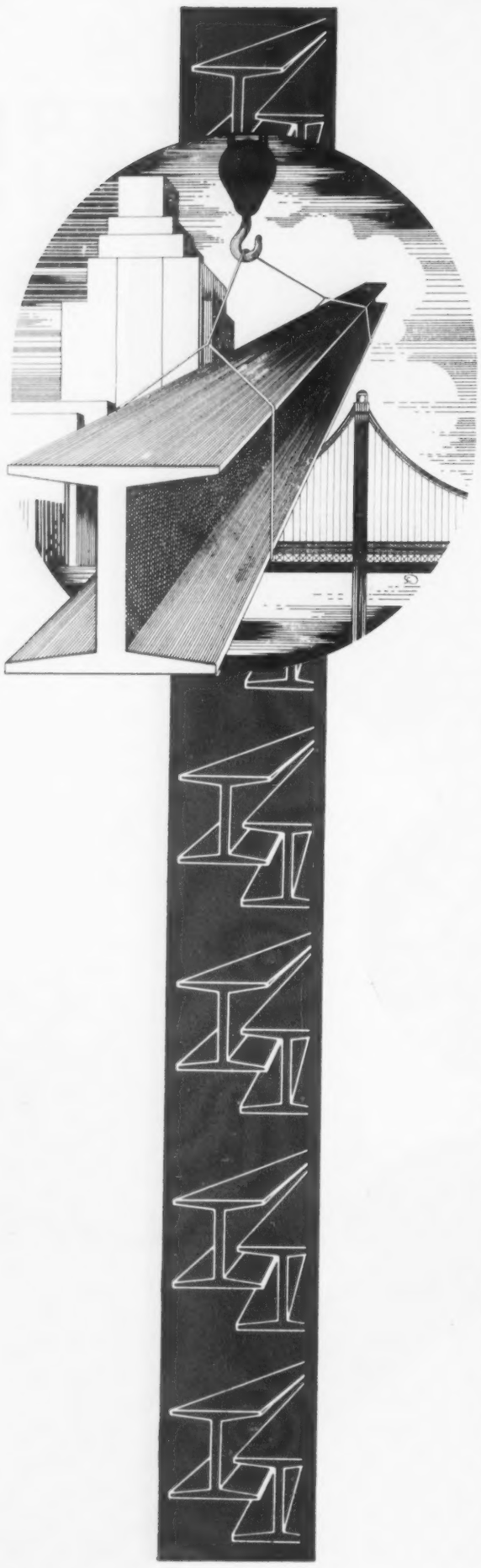
	1900	Today
Population	75,995,000	130,215,000
Savings banks		
Depositors	5,370,000	43,397,000
Total deposits	$2,134,500,000	$23,464,000,000
Life insurance		
Ordinary policies	3,176,000	34,416,000
Indus. policies	11,219,000	86,715,000
Total amount	$8,561,000,000	$104,667,000,000
Automobiles		
Passenger	8,000	24,449,924
Trucks	0	4,255,296
Tractors on farms	0	1,527,989
Railroads		
Miles	193,346	241,822
Passenger cars	34,713	40,600
Locomotives	37,666	45,100
Freight cars	1,365,531	1,760,000
Freight car av. cap.	29.4	48.0
Airplanes in use	0	10,446
Airports	0	2,299
Merchant marine		
Ships	23,330	25,392
Tonnage	5,165,000	14,654,000
Pipe lines, miles	1,000	136,000
Bridges, longest, feet		
Suspension	1,596	4,200
Cantilever	790	3,524
Steel arch	840	1,675
Steel truss	542	1,008
Buildings, highest		
Stories	20	102
Feet	286	1,248
Homes wired	...	23,000,000
Radios	0	26,500,000
Electric cleaners	0	11,000,000
Electric refrigerators	0	11,500,000
Electric ranges	0	2,000,000

WHAT'S AHEAD IN 1939

Highlights and shadows in principal steel-consuming and metalworking groups:

Construction 138
Railroads 141
Agriculture 144
Containers 147
Miscellaneous 150
Automobiles 159





CONSTRUCTION

■ FROM public work, stimulated by pump-priming and financed largely by federal grants and allotments, the steel industry may expect a heavy tonnage of structural and other constructional steel throughout 1939.

For the public works program, involving 6333 contracts awarded or to be let, about 1,000,000 tons of fabricated structural steel will be required, an estimated two-thirds of which will be rolled and fabricated this year. Some improvement in private building is expected. These factors should make 1939 steel needs exceed 1938.

Residential building is likely to be greater than the last three-year average, some surveys indicating an increase of as much as 40 per cent.

A gain upwards of 30 per cent is predicted in factory and industrial building. However, this type of construction last year was inactive and a 30 per cent upturn would still mean a relatively low rate of business in this division.

Commercial building, office structures notably in the urban areas, is not likely to mount, the most optimistic predicting a possible gain of 15 per cent with reservations.

Electric light, power and other public utilities will do more, possibly 20 per cent better than 1938. Uncertainty as to administration policies, involving regulation and competition by the government itself in the way of loans for publicly-owned plants is a retarding influence on private utility expansion, although the physical condition of many plants calls for replacement and expansion.

Little improvement is expected from railroads. However, aid is coming to railroads from some directions in the matter of grade crossing eliminations, a program which has lagged due to the lack of funds. New York state, for instance, by constitutional amendment has reduced from 50 to not more than 15 per cent the railroads' share of grade crossing costs. Thirty-five grade crossings are up for consideration this year in that state at an estimated cost of nearly $37,000,000.

Wider distribution of fabricated steel contracts is indicated by geographical location of public work and in the number of small tonnages involved.

More bridge contracts are assured during the months

just ahead, but large tonnages per project are exceptional.

An outstanding development in bridge construction is a tendency toward design of longer plate deck girder spans. Some 200 feet in length are under consideration, several in this class actually having been erected with such spans shipped in sections and spliced on the job sites. Depths of 14 to 15 feet for such girders are not unusual.

Engineers are of the opinion, however, that the limit has about been reached for practical design. With this trend is an increasing length of stringer and I-beam bridges, the latter frequently being now used for 98-foot spans with 84-foot I-beams almost standard with some state highway engineers.

Longer deck plate girders and I-beams spans are having a definite influence on shop fabrication, some of this work going out with a minimum of shop fabrication.

New York city, normally by far the largest consumer of structural steel, probably will take less this year. There will be no world's fair with its close to 50,000 tons of structural steel; in fact by the end of the year most of this material will be on its way to the scrap pile or to smaller shops for re-fabrication.

Few large bridges of the Triborough, Bronx-Whitestone or George Washington class, are planned, although the 18,000 tons for the Meeker avenue bridge, Brooklyn, closed in December, will be rolled, fabricated and erected early in 1939.

Chicago likely will top New York in subway construction. Approximately 50,000 tons of reinforcing bars and shapes will be required for that city's underground system. This will better the 30,000 tons estimated for New York.

Shipbuilding will have a banner year. Contracts already placed for passenger-cargo ships by the maritime commission will take close to 60,000 tons of structural steel, most of which is to be rolled and fabricated, while warships will take at least 50,000 tons, probably more. Not since the World war will shipbuilding consume so great an amount of steel.

Value of Construction Contracts

37 States; in dollars; 000 omitted

(F. W. Dodge Corp. Reports)

	Total*	Residential	Commercial	Industrial	Public works and utilities
1925	6,006,426	2,747,729	872,443	326,613	1,065,947
1926	6,380,914	2,671,120	920,890	471,249	1,340,351
1927	6,303,055	2,573,316	932,911	375,910	1,381,973
1928	6,628,286	2,788,317	884,609	508,840	1,464,480
1929	5,750,790	1,915,727	929,188	545,861	1,458,992
5-year av.	6,213,894	2,539,242	908,008	445,695	1,342,349
1930	4,523,114	1,101,312	628,809	256,632	1,651,238
1931	3,092,849	811,388	311,105	116,157	1,171,115
1932	1,351,158	280,067	122,718	43,490	590,301
1933	1,255,708	249,262	99,371	127,517	602,722
1934	1,543,101	248,840	150,595	116,078	751,236
5-year av.	2,391,698	538,174	260,023	131,975	953,322
1935	1,844,544	478,843	164,479	108,858	690,213
1936	2,675,295	801,624	249,136	198,019	920,412
1937	2,913,060	905,293	297,043	313,689	831,606
1938†	3,240,000	985,000	225,000	135,000	1,190,000

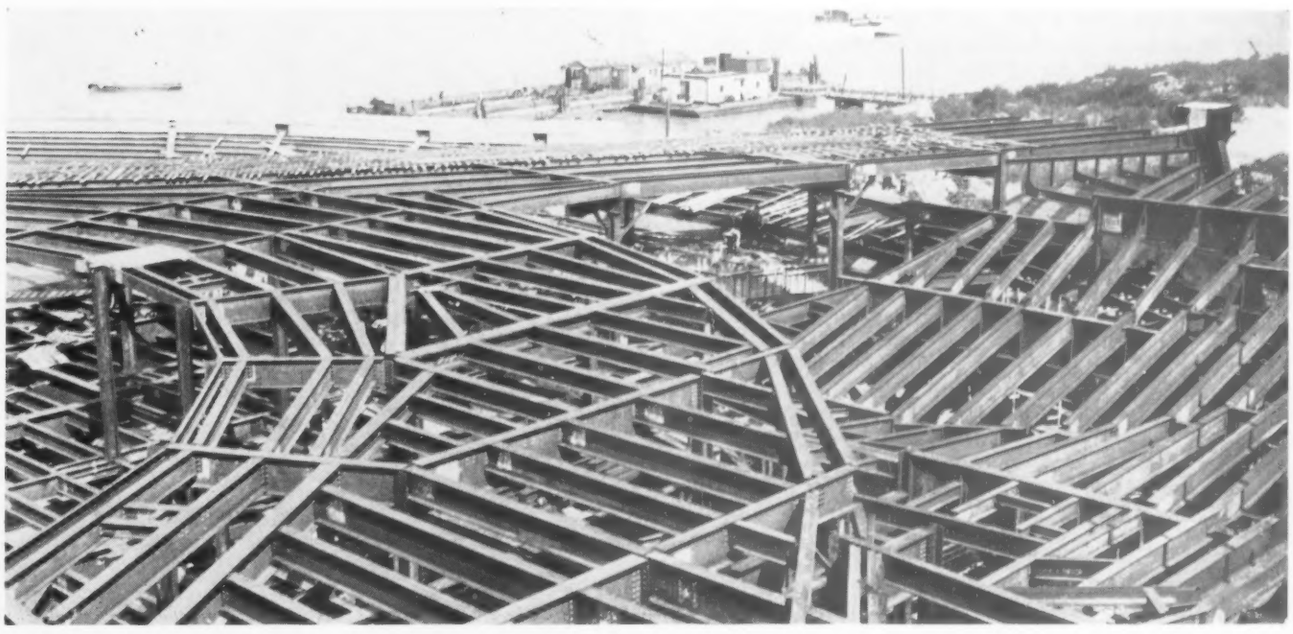
*Includes public buildings and all types of institutional buildings not separately shown in this table.
†Estimated, based on 10 months data.

Reinforced concrete construction is claimed to provide greater employment or more man hours per given number of cubic feet and many public projects have been designed for that type of building, notably for slum clearance, housing, barracks and veterans' hospital projects. This theory is open to serious question. Man-hours required to produce a ton of structural steel, from mine to job site, total 89. Direct labor for erection at site requires an additional 9 hours.

Nevertheless, the theory has an influence on awards of reinforcing and structural steel. The former tonnage last year was above 1937 while structurals were approximately 350,000 tons under 1937.

A country-wide survey among structural steel fabricators, engineers and building experts made by STEEL definitely indicates an improvement during 1939. A prominent Wisconsin structural shop head, with sales offices at Chicago, Duluth, St. Paul and Oklahoma City, feels the swing toward a more conservative government, evidenced in the recent elections, will encourage owners of industrial plants to proceed with repairs and extension programs.

Business men in Wisconsin are particularly well



■ Express highway and track covering, New York. Solution of traffic problems in congested urban areas is expected to develop demand for heavy tonnages of steel. Photo, American Bridge Co.

pleased with the change in the state government. As a result, while fabricating shops in that territory have been operating at a low rate, 20 to 30 per cent of capacity in most instances, and the outlook for the next three months is not too bright, it is felt the rate will be around 50 per cent by June and maybe 80 to 90 per cent during the final quarter. This is based largely on expected requirements for the large government construction program and moderate increase in private building, both industrial and residential.

Like most commentators, a leading Oklahoma fabricator raises the question of prices for fabricated and erected structural steel and costs. Holding that any change in tonnage and the price structure must be upward, this executive feels one would have to be a fantastic optimist to finance much new construction. Added to radical labor agitation, the present Wagner act and wage and hour law preclude lower shop and field costs; on the contrary such costs may be higher.

So long as steel fabricators are willing to sacrifice a substantial portion of their overhead, competitive materials will make little, if any, inroads on tonnage; but prices are too low, claims this Oklahoman, and profits are nil.

In the Southwest, notably West Texas, Arizona and New Mexico, fabricators are penalized by being in a high freight rate district. This, since 1926, has had a tendency to check new construction other than that carried on by government money. Private building since that year has been dropping off steadily and has almost reached the zero point.

An Ohio independent looks for more private construction, feeling the trend toward labor-saving machinery will mean more industrial construction. There has been a backing up of capital which awaits a safe investment. Outlook for a more reasonable return has improved. Lower shop and erection costs appear out of the question. Prices should, and probably will be increased, this fabricator pointing to the fact 1938 statements will show a loss.

Building Wages High

In upstate New York, Rochester district, steel erectors are getting $1.37½ per hour and are asking for $1.60 early this year. Comparative high wages in all branches of the building trades; mounting local taxes and the attitude of the federal administration toward business are factors operating to offer a not too rosy prospect for the next 12 months, although some tonnage will develop through the PWA.

Around Rochester, since 1930, shops have not averaged 40 per cent of capacity. In 1937 the total for shops in the immediate district was under 9000 tons and for the first nine months last year the aggregate output was only approximately 2700 tons, less than 20 per cent capacity. These shops from 1920 to 1930 were all busy.

This drop in tonnage has been accompanied by prices far below costs and the situation in Rochester is typical of many small capacity districts where independent shops are trying to weather adverse conditions. Shop forces are also organized with the scale higher than in some other sections and no reduction is in sight.

Here, as in scores of other districts the principal grievance is being forced to bid such low prices as to prevent outside fabricators from taking all the work in such local territories. Most projects of 50 tons and over are bid at prices that do not cover overhead. The situation is common throughout the country.

Although a sharp increase in public work is indicated for New England, a substantial spurt in inquiry developing late last year and likely to continue through the first half of 1939, shops in that district are not expected to benefit in ratio due to outside competition. Bridge fabrication in New England shops has practically ceased, fully 95 per cent of the tonnage going to outside fabricators, a condition expected to continue.

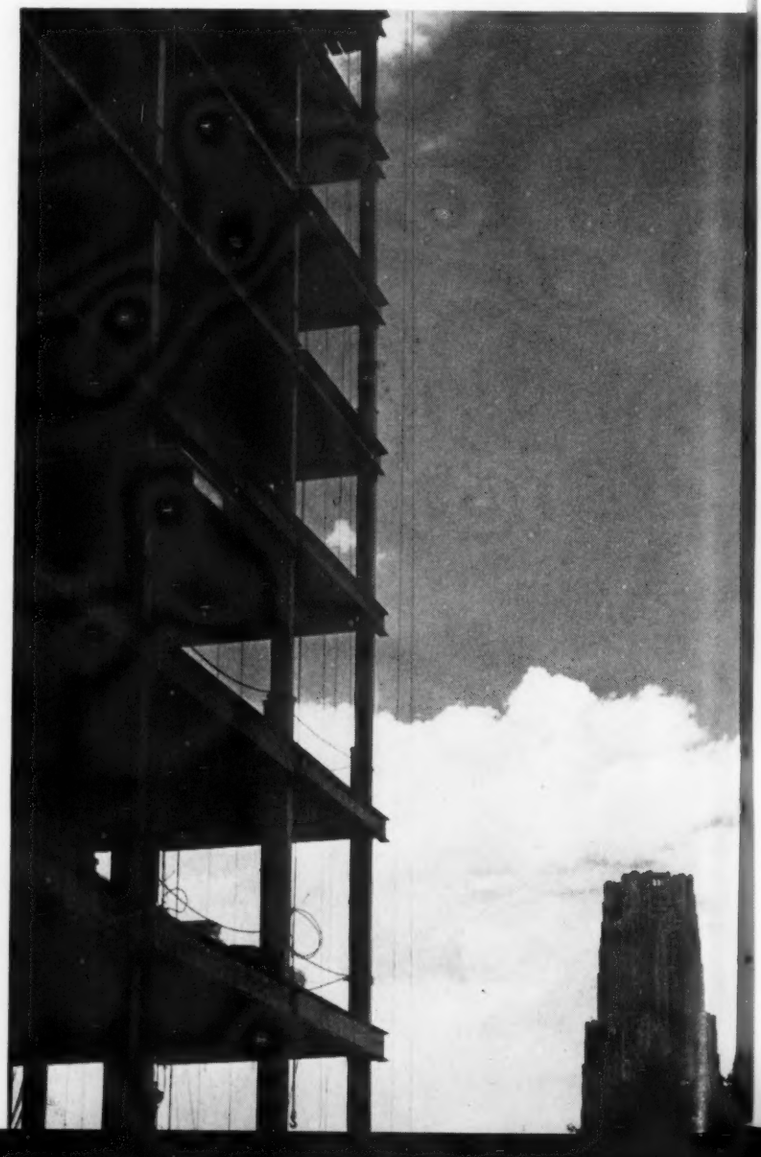
At Providence, R. I., a section of an elevated highway will be erected, enhancing the highway safety program of that city. Incidentally the largest welded-erection job of last year is being completed at Boston, a hospital building.

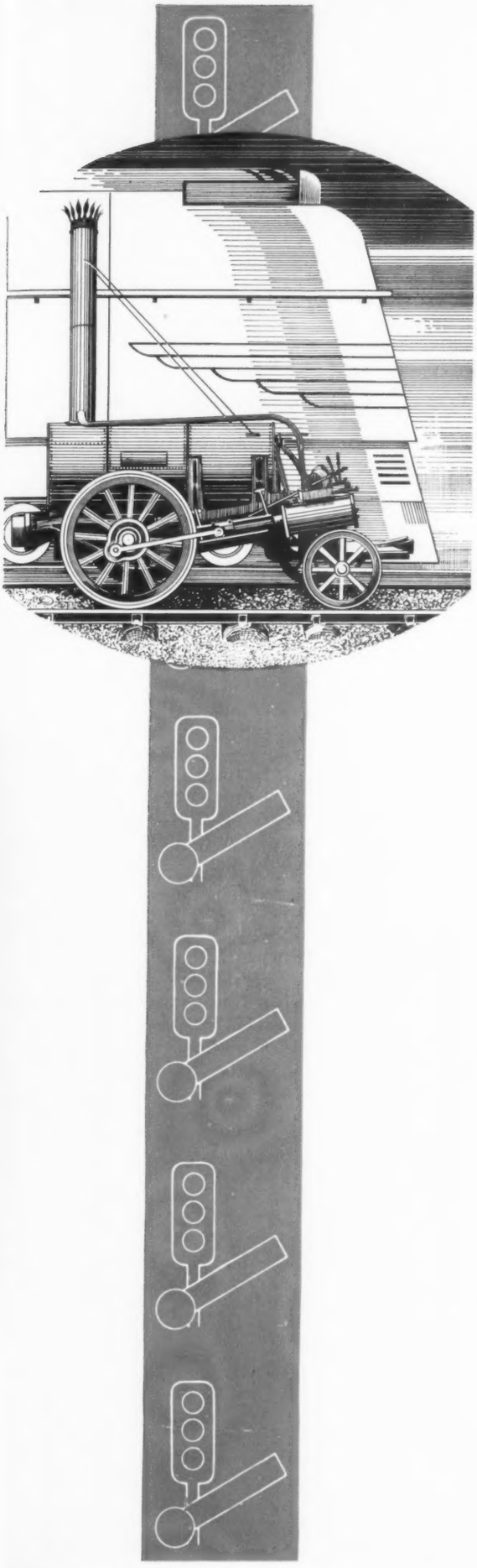
In Pennsylvania close to 35,000 tons of shapes and bars will be required for the Harrisburg-Pittsburgh toll highway while a substantial increase in government-financed work is assured. Considerable tonnage placed during the closing weeks of 1938 is yet to be fabricated and in many cases rolled.

New Jersey will probably take more construction steel, but that industrial state will be well below normal in private building. Navy yard expansions on both coasts are under way with numerous contracts

(*Please turn to Page* 146)

■ **Welded steel structure in Pittsburgh. Welding is becoming more important in building construction**





RAILROADS

■ RAILROADS had a sorry year in 1938. Purveyors of materials and equipment to the carriers had an equally unsatisfactory 12 months. Both groups are hopeful of better times in 1939.

Weak financially at the opening of last year, a sharp drop in earnings to one of the lowest levels in modern history helped win for the railroads the doubtful honor of becoming the nation's No. 1 industrial problem.

With a large part of total railroad trackage already in bankruptcy and with an unmistakable trend toward government ownership unless assistance in the form of materially better business is forthcoming, ample reason is available for concern over the railroads' future.

Unlike 1937, last year closed with traffic and earnings well above the low point of earlier months. Net railway operating income in the first quarter was far less than in such drab years as 1932 and 1933. The remainder of the year did better, fourth quarter income exceeding that of the corresponding 1937 period.

It will be recalled, however, that the final period of 1937 has had few equals in paucity of railroad earnings; no other post-1929 year made a worse showing in its final three months.

Nevertheless, instead of disappointment over the collapse of a promising business recovery—the experience a year ago—railroads start the new calendar moderately cheered by progress made the second half of 1938. Unfortunately, the road ahead still has a plentiful supply of hurdles that must be cleared before the carriers top the grade.

What is this railroad problem for which management, labor and government are seeking solution? Its definition is simple, but its correction seemingly is complex. Briefly, it is the inability of the roads as a whole to earn enough revenue to meet operating expenses and fixed charges.

The malady has not become an epidemic. A few individual roads still rank among the premier industrial money-makers of the nation. Their credit is sound, their cash position ample and their equipment modern.

At the other end of the line are the hopeless cases—

habitues of the courts, confirmed bankrupts, payers of dividends only during boom years, unable to keep in step with the times in freight and passenger carrying facilities.

Between these two groups are many roads strong and still capable of responding to the right kind of treatment but at the moment weakened by depressed business and the other circumstances that are the underlying cause of this deep-seated problem.

These other circumstances are well-known. Chief among them is the competition of other forms of transportation—automobiles and trucks, water carriers, pipe lines and airplanes. Freight handled by the railroads in 1937, best industrial year since 1929, was less than in 1916, although total freight movement was far ahead of the volume 21 years earlier.

The automobile and bus, of course, slashed the railroads' passenger-carrying business. Passenger travel by rail declined almost without interruption from 1920 until 1934, the reduction for the period being 65 per cent. Since the latter year business recovery, aided by the introduction of improved trains, turned the trend upward.

If it took the railroads almost 15 years to recognize competition of the automobile by offering better service and equipment in an attempt to win back lost business, their ineffectiveness in coping with rival freight carriers is not to be wondered at, according to some observers.

At the same time, the matter of saving the railroads from gradual disintegration is not an attempt to arrest a natural supersedure of various forms of transportation over one that has become relatively less efficient in some respects. The railroads still constitute the nation's prime carrier of freight. For the movement of numerous commodities they are indispensable. The welfare of industry in general is tied up with not only the railroads' efficiency as a transportation agency but also with their volume of consumption of innumerable raw materials and finished products.

Carriers Financially Anemic

Railroads point to other factors responsible for their financial anemia, in addition to the encouragement given by national, state and local government to competing transportation media. One of these is the fact revenue per ton-mile of freight traffic has declined steadily the past 15 years. Early in 1938 the carriers were granted a small rate increase—materially less than the figure they thought they deserved.

Average freight revenue per ton-mile in 1922 was 1.177 cents. Since then it has declined more than 20 per cent. A sharp increase in freight rates might appear to be the answer to the railroad problem, but likely this would do more harm than good through diverting a larger amount of traffic to competing movers.

Labor is another headache to the railroads. When business hit the skids last year the carriers sought to reduce wages—at the time the highest in history on an hourly basis and higher than in 1929 on a weekly basis. The unions naturally declined the cut, thereby starting the matter on the rounds of the various boards and committees prescribed by law for handling such questions.

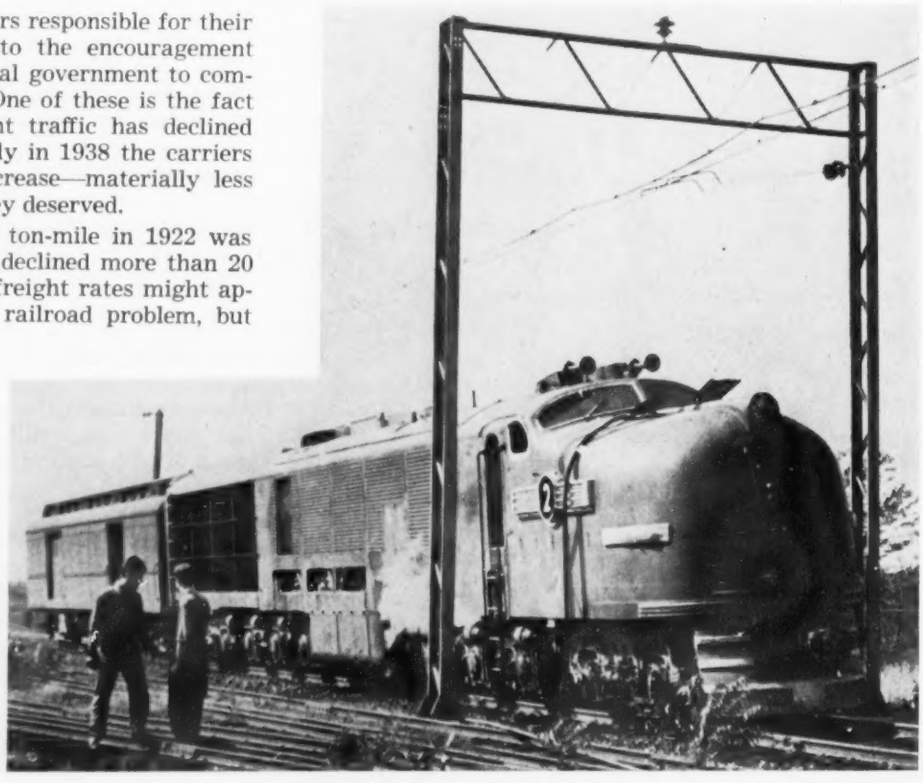
During the several months negotiations were under way, hopeful signs of business recovery started to blossom. Consequently, the President's emergency fact-finding board decided it should not discourage these blooms by recommending lower wages for such an important industry as the railroads. This meant that the only savings made in labor costs were effected through curtailment of employment in operating and maintenance departments.

Roads Await Congressional Relief

At the time of the board's recommendation against lower wages, the national administration indicated it would encourage legislation looking to some avenue of relief for the carriers. Labor and management were called upon to co-operate with the government in pushing this program. The committee named by President Roosevelt has drafted recommendations for action at the new session of congress.

Proposals this management-labor group seeks to have enacted may affect not only the ability but also disposition of the roads to carry out desirable rehabilitation programs.

It is hoped to amend the interstate commerce act so as to give the roads broader powers in fixing freight and passenger rates. Additional lending capacity for the Reconstruction Finance Corp.; repeal of land grant rates and the long and short haul pro-



■ **Steam's latest challenge to diesel power—the new 5000-horsepower, steam-electric, passenger locomotive built by General Electric Co. for Union Pacific railroad. Employing a turbine-driven electric generator instead of the conventional reciprocating steam engine, improved operating economy and performance are claimed**

■ **Diesel-powered passenger trains, for several years widely used in the West, now link the two coasts. Baltimore & Ohio's newly streamlined Capitol Limited shown leaving Maryland and crossing the Potomac river on its first run to Chicago late last year. The 3600-horsepower diesel-electric locomotive hauls the train the entire distance**

visions of the commerce act, and sale of the federal barge lines are other objectives.

Employment by railroads has shown the contraction that is common to an industry attempting to cut operating costs to the bone. In 1937, average number of employes of Class I roads was 1,115,077. This was a decrease of more than 32 per cent since 1928. In view of the reductions of only 17 and 22 per cent in freight and passenger traffic, respectively, in the same period, it appears that the railroads have shared in the tendency of industry toward increased production per man-hour.

Last year saw a further sharp cut in employment. The ebb was reached in May, when average number of workers dropped to 905,000, but a steady upturn developed thereafter. Annual average wage of rail employes continued at a peak for recent years.

Retrenchment in expenditures was reflected in the small tonnage of steel products taken by the railroads in 1938 for equipment repairs and the building of new freight cars and locomotives. Purchases of all materials and equipment last year were more than 50 per cent less than in 1937, when steel requirements totaled nearly 3,840,000 tons.

Rail, Car Production Low

Freight cars ordered the first 11 months were only about one-fourth the 1937 total of 51,600 units. Rail production for railroad use the first nine months was only 450,000 tons, against an average of 2,450,000 annually from 1922 through 1930 and an average of 1,180,000 in 1936 and 1937.

While a substantial volume of deferred rail buying has accumulated—possibly several million tons—annual requirements have been reduced since the early 1920's through the availability of a better product and improved maintenance methods. Hence, if and when the arrearage of recent years is made up it is unlikely the railroads will offer the large market for this product such as prevailed a decade or two ago.

Freight car needs also are heavy. The excess of discarded units over replacements the past 13 years has been more than 600,000 cars. Freight traffic has slackened in the meantime, however, and the capacity of individual cars has increased, consequently fewer units are required. In fact, in relation to the amount of freight offered the railroads, almost as much carrying capacity to handle it was available in 1936-37 as in the lush years 1927-1930.

On the other hand, during the pre-depression period the railroads found it desirable to replace 2.7 per cent of their existing capacity each year. This figure dropped to 0.5 per cent in 1931-1935, jumped to 3.3 per cent in 1936-37 and again settled below 1 per cent last year. These data indicate that the theoretical accumulation of postponed freight car buying necessary to bring freight carrying facilities to an average condition comparable to the relatively low traffic volume of 1936-37 amounts to about 250,000 units.

Old cars can be repaired and continued in service, of course, but the saving in operating cost incident to the use of the modern light-weight freight carriers may be expected to stimulate their replacement rather than rebuilding, finances permitting.

High-Tensile Steel Lowers Car Weights

Examples of the new type of light-weight freight cars are the 50-ton all-welded box car and 40-ton welded-riveted refrigerator car introduced late last year by American Car & Foundry Co., New York. High-tensile corrosion-resisting steel is used to the fullest extent practicable in both types of cars. Light-weight of the box car is 37,500 pounds and that of the refrigerator car 44,200 pounds. This is a reduction in weight of about 4 tons in each design.

General American Transportation Corp. also brought out a light-weight type of all-welded box car. This unit weighs 36,800 pounds, 8500 pounds less than the standard AAR car. Two units have been built and are in service to demonstrate their performance.

Number of available steam locomotives has declined steadily since 1925. Because of an accompanying rise in tractive power of new units, total capacity has dropped about in proportion to the shrinkage in freight and passenger traffic. Consequently, the railroads appear to have enough power to enable them to handle business of 1936-37 volume, but the advanced age and accompanying obsolescence of thousands of existing locomotives dictate their replacement by more modern and more efficient units as rapidly as possible.

Purchase of numerous diesel-electric locomotives

(*Please turn to Page* 220)

AGRICULTURE

■ THE agricultural year 1938 suffers by comparisons with 1937, though it can be described as a good year.

While it is true that farm cash income, prices received by farmers for their products, and domestic farm equipment sales all declined from 1937 peaks, the farmers' buying power was only 7 per cent lower than in 1937. While prices of farm products declined, prices the farmer had to pay for necessary goods also were down.

With 1929 as 100, prices received by farmers declined to an index number of 44 by the end of 1932. Farm cash income fell to 40 in 1932. Domestic farm equipment sales dropped to approximately 25.

The trend for all three was slowly upward in 1933, and then more accelerated during the following years until prices received by farmers reached an index of 84 by the end of 1937. In the meantime, farm cash income rose to a point of 83, while domestic farm equipment sales soared to an index number of 110 by the end of 1937.

During the past year, as will be noted by the accompanying chart, prices received by the farmer for his products, according to preliminary data, slipped to an index figure of 64. Farm cash income dropped to about 74. Domestic farm equipment sales declined to 82. Thus the picture of the agricultural year 1938 is one painted with downward strokes.

However, the index of prices that the farmer had to pay for goods necessary to his operations fluctuated more moderately than did the other three.

Starting with 1929 as 100, prices paid declined only as far as the index number 70 by the beginning of 1933. During that year there was little change, the index rising approximately 1 point. The trend during 1934 was more sharply upward, reaching 80 by 1935. At the end of that year, the index had risen 3 more points, but tapered off several during 1936.

In 1937 the index reached approximately 85, and during the past year declined to an estimated 81. This means that, with the exception of the slight upturn in 1937, the prices paid by the farmer have remained at a fairly consistent level since the beginning of 1935.

With farm cash income growing during this time, buy-

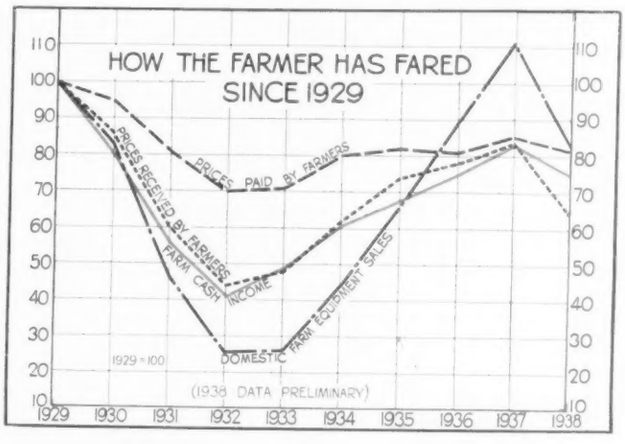
ing power continued to increase up until 1938. Since then, however, both farm cash income and prices paid by the farmer have declined, the net result being that farm buying power is little changed.

The steel industry's chief outlet in agriculture is through the farm equipment industry, long one of its best customers. A survey of this farm equipment industry in the past year shows consumption of important tonnages of iron and steel, but that industry's sales and profit graphs are of negative appeal.

Sales of farm equipment, which reached a high point by the end of 1937, declined sharply during the past year. Profits declined even more so, the equipment builders being unable to pare production costs as rapidly as sales were declining.

Estimates of how much farm equipment sales shrank during the past year vary from 20 to 35 per cent, compared with 1937. Certainly the decline was no less than 20 per cent, while the consensus places the loss at approximately 25 per cent for the farm equipment industry as a whole. But here again it is necessary to remember that 1937, the year with which 1938 is being compared, was unusually good for the farm equipment manufacturers.

Equipment sales reached a low point early in the past summer, when numerous plants curtailed production heavily, laid off thousands of employes.



Some closed down. Inventories of finished equipment had become excessive. By the latter part of the summer and early fall, inventories had been worked off to a point where more production was necessary. Men were called back to work and production schedules were arranged to provide as steady employment as possible.

At present, however, farm equipment interests indicate their current production rate is not warranted by the sales made today, but is going ahead in anticipation of spring demands. Farm buying power still is potent and indications are definite that large stocks of equipment will be needed this spring.

Numerous factors must be considered in summing up the outlook for 1939, as regards farm equipment sales and, consequently, demands for iron and steel. Strength of farm buying power is not the only element, although it has been the industry's experience that poor business always resulted in a year when buying power was low, and good business in a year when buying power was high. Some interests contend the farmer will not be disposed to buy if the prices he is receiving currently for his products are low. The opposite viewpoint is that, as long as reserve buying power is there, the rest is merely a matter of salesmanship. Recently, prices of farm products have declined.

A study by the National Industrial Conference board indicates prices for 11 out of 12 principal farm commodities were decidedly lower in September, 1938 than the September average for 1923, 1924 and 1925. Price of milk in September, 1938 was 34 per cent lower, eggs 19 per cent lower, potatoes 54 per cent lower. Wheat was 55 per cent lower; corn, off 51 per cent, oats 47 per cent and hay 46 per cent, as compared with prevailing prices 15 years ago. Only beef cattle prices show a gain, 11 per cent over the 1923-1925 September average.

During September, 1938 prices of wheat, oats, cotton and wool were the lowest for the corresponding month since 1932, corn the lowest since 1933, sheep and hogs since 1934; and milk and potatoes since 1935.

However, some encouragement is seen in indications that farm prices have, for the present, touched bottom and that further declines are not in store. Assuming this is true, farm income in 1939 will then depend chiefly on volume. Here crop prospects enter the picture and, as always, crop prospects are problematical at this time of year. The most favorable crop prospects hinge at present upon prevailing moisture conditions, and, at the latest reports, moisture conditions in the chief agricultural states are now favorable.

Expect 1939 To Be Fair Year

Agricultural prosperity plays an important part in determining general industrial and business conditions; also this frequently works the other way around. Rising industrial activity is reflected in general stimulation of business, and finally in better demand for farm products. In this connection, it is foreseen that the present state of industrial activity will be reflected favorably in the agricultural industry.

Viewing the agricultural year 1939 at long range, a majority of leaders in the equipment industry incline to the hope that business will be as good as in the past year, some even feeling that to attain 90 per cent of the business done in 1938 would be a fortunate circumstance. They do not expect a very big year, but on the other hand, are confident 1939 will not be a poor one.

In the meantime, some sources have already predicted farm income in 1939 will be as much as 7 per cent improved over 1938.

The statement has been made that 1939 will closely parallel 1936 in the agricultural industry. In this respect it will be noted prices paid by farmers have declined to a point on a par with the prices paid during 1936.

Equipment sales, which rose 25 per cent during 1937, declined approximately 25 per cent during 1938, thus resulting in a throwback to below 1936 levels. Farm cash income, however, is higher at present than it was at the start of 1936, while prices received by the farmer are lower.

A good year is forecast for one of the most important items of farm equipment, the tractor. Pre-

dictions that tractor sales during 1939 will exceed 1938 are based on several factors, one of which is that models now in use are becoming obsolete, a recent survey having shown that 24 per cent were made before 1928. Another is the introduction of the popular smaller models, while rapid changes in farm operations are said to presage heavier sales of the all-purpose tractor. Finally, animal power available on farms is steadily decreasing.

The importance of the all-purpose tractor is indicated by the fact that these models, in 1931, comprised but 33.3 per cent of tractors in use on the farms, while in 1937 the proportion had grown to 79.2 per cent and is still increasing. The all-purpose tractor is seen as gradually replacing the standard 4-wheel model, of which many still remain in use. In addition to increased tractor sales, all combines are expected to sell well in the present year, especially small combines, which have been growing in popularity.

Reports from the equipment industry for November—the first month of the new fiscal year—are poor, but the first month is seasonally so, the equipment interests indicate. November was even below the corresponding month in 1937, but the trend now is not downward, and the best months lie ahead.

Construction

(*Concluded from Page* 140)

already placed, much of which is yet to be fabricated.

Improvement in building which started during the last quarter will carry over through the first quarter, but in the opinion of many will be slowed down by high building trades wages and other costs about the middle of the year. Whether steel prices will reflect these higher costs is a question. Nothing indicates at this time that the sales price of structural steel will do so fully.

Looking dangerously far ahead, some expect the slowing down during the second half of 1939 to be followed by a boom, starting in 1940-41 and reaching a peak in 1943.

The fabricating steel industry entered this year with around 400,000 tons available for future fabrication. The last quarter was the best of 1938, reflecting government pump-priming, but total bookings fell several hundred thousand tons below the 1,628,641 tons of 1937.

Outstanding contracts placed last year included: 70,000 tons, dam, Washington; 55,000 tons, housing project, Bronx, N. Y.; and 35,000 tons, water aqueduct, New York. On the whole there were more contracts placed, but with fewer notable large tonnages. New York subways took 21,000 tons; some years such work has averaged 200,000 tons.

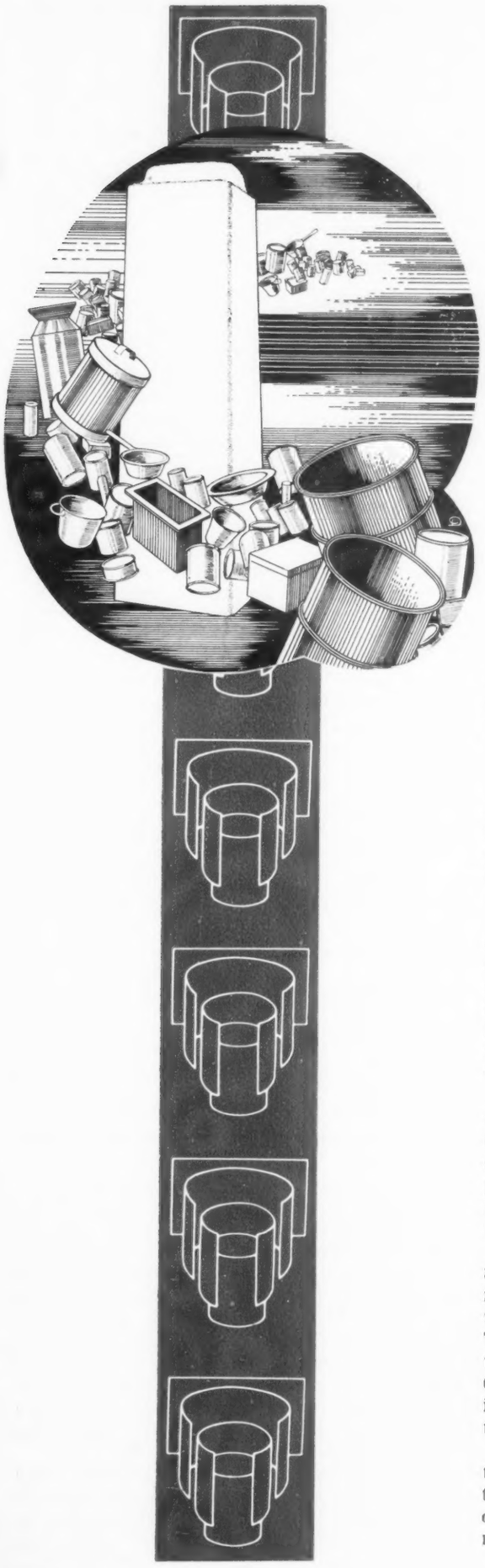
The position of the all-steel or steel-framed house remains practically unchanged. Potential tonnage is tremendous, but it would be folly to predict widespread acceptance by the average building family in the near future. Designs have improved and prices lowered, but the steel house has not yet been sold to the American housewife.

Sacrificing profits for tonnage continues in the fabricating industry. This is just as true in reinforcing steel, probably more so than heavier material. The industry, still with an annual capacity of close to 5,000,000 tons, finds many independent shops of moderate productive capacity forced almost to the wall to get even a small share in their respective territories. Fabrication-in-transit rates hit many hard. Shops connected with structural mills are going out for even smaller tonnages.

Profit per ton with numerous fabricators has practically vanished. The f.o.b. cost of structural steel has climbed higher and prices have not followed in proportion. The average delivered selling price of fabricated structural steel in 1937 was close to $85 a ton, up slightly from the previous year due to much heavier costs, but the sale price for 1938 has not kept pace with the still mounting costs.

Structural steel continues the cheapest building material and for that reason inroads by substitutes are few. Price per ton for fabrication, about $45 for the country as a whole at the last available figure, is at least as high today, probably higher.

■ **Tractor pulling new one-man harvester-thresher, a McCormick-Deering No. 60 combine. Demand for small combines has been exceptionally good**



CONTAINERS

■ THIS YEAR will witness continued transition in the tin plate industry, with gradual expansion in consumption from the somewhat poor 1938 period. This is freely predicted in both the producing and consuming industries.

Cold-reduced tin plate has been produced for nearly ten years but now is forging ahead more rapidly. Some mills offer only the cold reduced product and many believe it will dominate the tin plate picture within the next two years. Indicative of the trend was the recent decision of one large interest to buy uncoated cold-reduced coils and tin them in its own plant.

The American Iron and Steel institute reported production of cold-reduced plate of 486,345 gross tons for 1936 and hot reduced at 1,616,808 tons or in the ratio of approximately one to four. In 1937, the respective figures were 865,128 tons to 1,553,062 or a ratio of less than one to two. Last year, cold-reduced plate went ahead of hot plate for the first time when the figures for the first nine months were 585,690 and 484,952 tons, respectively.

Comparative figures for the first nine months of 1938 tell the complete story. It will be noted that production of cold plate increased quarter by quarter while hot plate output steadily declined. This also was reflected in the export market, when, in the third quarter, movement of cold reduced went ahead of hot rolled for the first time. The figures are presented in the accompanying table.

Total tin plate capacity at the end of 1937 was 2,961,-812 tons. The Steel institute began reporting breakdown figures by processes at the end of the first quarter. At that time, it was revealed that cold reducing capacity at 1,-747,671 tons actually was ahead of hot plate at 1,694,206 tons. In the second quarter, hot plate capacity dropped 62,250 tons, while cold reduced gained 80,429 due to changes in the Pittsburgh district. No further revisions in capacities were reported for the balance of the year.

From the standpoint of tonnage, the tin plate trade shared the reduction sustained by the entire iron and steel industry last year. Estimated output was 30,000,000 base boxes or approximately 1,325,000 gross tons. This compared with record production of 54,000,000 base boxes or 2,418,190 tons

for 1937, and 47,000,000 boxes or 2,103,153 tons for 1936. Both 1936 and 1937 established new high records.

Production was adversely affected by the extremely heavy coverage by canmakers prior to the advance from $4.85 to $5.35 announced in May, 1937, but which did not become actually effective until Sept. 30, 1937. Production through September of that year averaged 225,000 tons monthly but dropped to 130,000 tons per month in the final quarter and further to 110,000 tons monthly in 1938. Production in 1938 by no means reflected consumption during the year and this was borne out by reports that a number of consumers were able to go well through 1938 on plate bought at $4.85. Estimated can company sales declined 6 to 10 per cent in dollar volume.

■ **Automatic device quickly loads freight cars with containers**

Other factors hindered tin plate in 1938, in addition to heavy stocks. The feeling was manifest that prices were too high in the spring of 1938 and this was given verbal expression in a letter from the American Can Co. to its customers stating that it would give them the benefit of any lower prices received on tin plate purchased in 1938. The widespread reductions in other steel products in June and the elimination of the differential between the Pittsburgh and Chicago base prices also affected buying psychology.

The reduction to $5 per base box in the fourth quarter last year and the decision to refund 25 cents a box on all plate purchased at $5.35 therefore came as no surprise to the trade. More surprising was the decision of tin plate sellers to cover their customers ahead only for the first quarter of this year. This has led to the belief that an advance may be in store for tin plate especially if business continues to pursue an upward course. Pig tin prices are up about 10 cents per pound from the 1938 low point.

Prospects for the tin plate trade this year are somewhat blurred by the outlook for the bread-and-butter lines, namely the large fruit and vegetable packs. However, few believe that the current year will not show at least moderate improvement over 1938. The carryover of principal vegetables was heavy at the beginning of the year. This applied especially to the pea crop which was of excellent quality. The tomato, corn, string bean and fruit packs also were above usual averages with the result that 1939 opens with substantial stocks. The situation as regards milk and fish packs, both standing near the top in volume, is more nearly normal. Even though 1939 packs of vegetables and fruits are not of record proportions, the tin plate trade will benefit from materially lower stocks of plate in the hands of canmakers. Also, special merchandising campaigns are being organized by canners to stimulate consumption of those commodities in which surpluses exist.

Three Major Vegetable Packs

(Unit: 1,000,000 cases)

	1938	1937	1936	1935	1934	1933	1932	1931	1930
Tomatoes ...	20.5	24.0	15.7	13.1	12.0	16.0	9.6	10.0	
Peas ...	25.4	23.3	16.0	24.6	15.7	12.9	10.4	13.3	22.0
Corn ...	20.8	24.3	14.0	21.0	11.3	10.2	9.4	19.4	15.7

Further expansion is expected this year in the market for fruit juices. This outlet for containers blossomed out during the depression. Illustrative of its growth is the fact that more pineapple juice than fruit now is sold in cans. Grapefruit juice also constitutes one of the volume products and the future for fruit nectars, such as peach and apricot, is said to be bright. Orange juice so far has not been entirely adapted to preservation but canning technique is improving rapidly. Marketing of lemon juice is showing progress and apple juice and grape juice in cans now are expected to gain in 1939.

So-called general line cans, including all other than food containers continued to show steady progress in 1938. Production of both oil and coffee containers established new high records and are apparently

headed for still higher records in 1939. Continental Can Co. will spend $500,000 for a new plant at Oil City, Pa., to make one, two and five-quart cans; and a large coffee company may revert to metal containers.

Beer can production also held its own in the year 1938. About 37 per cent of the packaged beer sold in metropolitan New York last year in retail outlets for home consumption was in cans while the proportion in Boston was close to 60 per cent. The average for the balance of the country was much less due to a price structure less competitive with bottled beer. In New York and Boston, canned beer is sold at 10 cents per unit while the price outside these areas generally is 15 cents. The price on the bottled product averages 3 for 25 cents, plus deposit. According to canmakers, it costs less to market beer in cans than in bottles and expansion in this business is anticipated. A new quart can is already established.

New Trends in Food Marketing

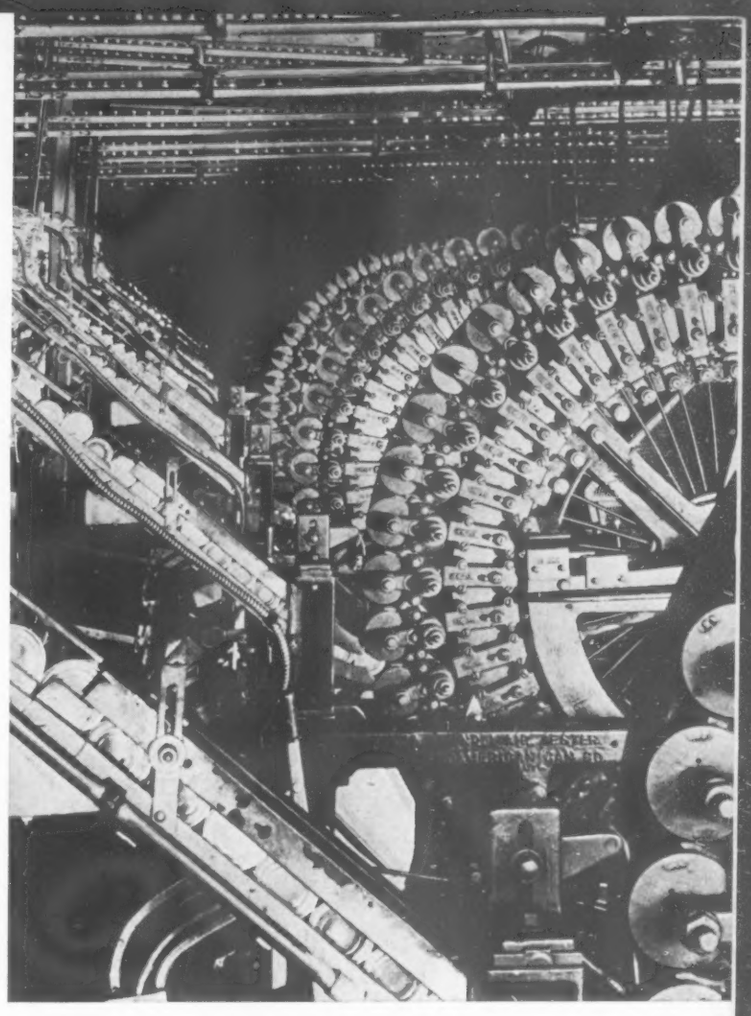
Rapid development of the "super market," which now has finally invaded the East and already is well established in the Middle West and on the Pacific Coast, marks a new trend in marketing of foods. Approximately 35 per cent of all package food now is sold in such markets, the success of which is dependent upon the reduction of overhead, accomplished principally by allowing the customer to serve himself. This type of merchandising requires handy containers which may be stacked for mass displays and which do not involve a deposit. Super markets will be largely responsible for the marketing of soft drinks in cans, a likely development for 1939.

The increasing popularity of quick-frozen foods has not cut into the metal container business since they are comparatively high-priced and, therefore, compete only with fresh products. In fact, frozen foods have resulted in more business for the tin plate trade for the reason larger packages for restaurants and hotels have metal tops and bottoms.

General betterment of world conditions is expected to result in a pickup in export business in tin plate this year, although the situation may be complicated by increased foreign competition. In 1937, 354,339 tons was shipped abroad at the rate of 29,528 tons monthly compared with 169,796 tons or 19,866 tons per month in the first nine months of 1938. The statistics previously cited indicate that foreign tin plate users are beginning to appreciate the merits of cold reduced plate.

Domestic canmakers are giving some thought to the possible use of tin plate in coils rather than in flat sheets. Cold reduced plate is tinned in coils and canmakers consequently believe its use in this form is a logical future development. However, the preliminary changeover to coils is not expected to be a development of 1939. A few sample coils have been shipped, however.

Canmakers point out that cold reduced plate, as now used in flat sheets, is easier on equipment because of its inherent ductility and the fact that it is rolled precisely to gage and accurately sheared. Cold reduced plate was not acceptable to canmakers a few years ago since it was too soft.



■ This tester handles 350 cans per minute. Each can is subjected to air pressure and automatically ejected if faulty

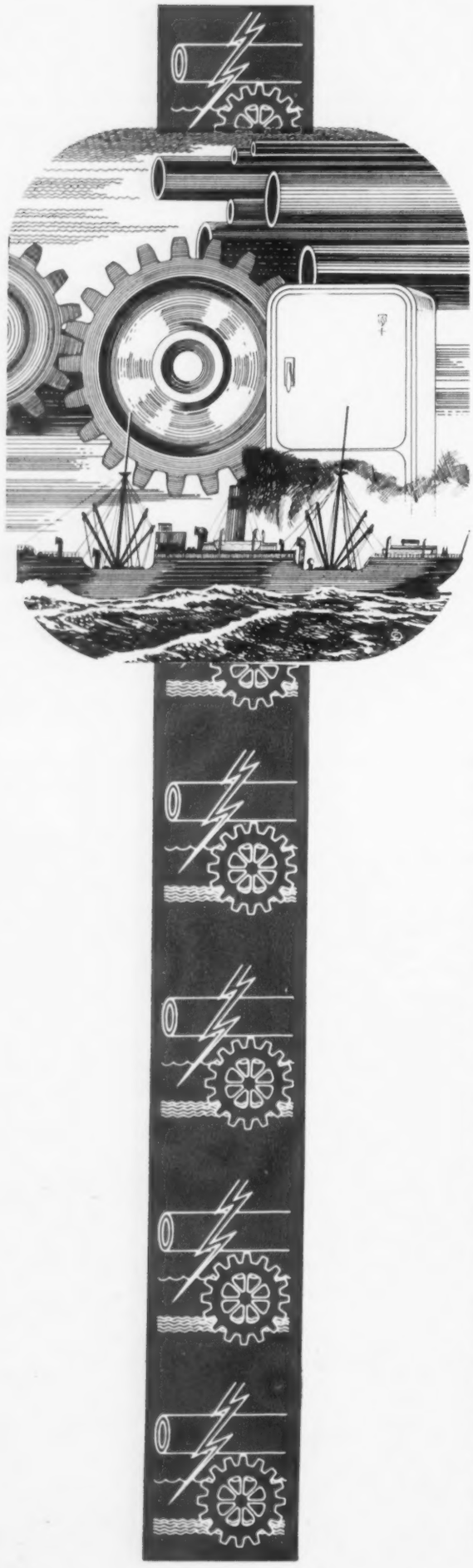
Electrolytically coated tin plate is expected to loom up more importantly in the future since the process results in extremely uniform distribution of tin. A number of packs have been made with electro-tinned plate and it is said that it will also make metal containers more competitive in the dry package field where an extremely light-coated product is acceptable.

Some publicity has been given to silver-lined cans but the trade sees no prospect for their widespread use. Cans made experimentally had coatings 0.001-inch thick, or over ten times the ordinary tin coating, and the indicated cost on a production basis was 50 cents per unit. Experiments on aluminum coated plate continue.

Tin Plate Production, Exports and Capacity in 1938

(Gross tons)

	Cold Rolled	Per Cent of Capacity	Hot Rolled	Per Cent of Capacity	Total Production	Exports	
						Cold Reduced	Hot Rolled
First Quarter	165,772	37.9	190,250	44.9	356,022	14,683	70,115
Second Quarter...	209,692	45.9	173,552	42.5	383,244	14,011	36,291
Third Quarter....	210,226	46.0	121,150	29.7	331,376	21,325	13,371
Nine Months..	585,690	42.7	484,952	39.7	1,070,642	50,019	119,777



APPLIANCES
PIPE LINES
AIR CONDITIONING
MACHINERY
EXPORT

■ STEEL demand by miscellaneous users, while down sharply from 1937, last year was relatively better than from the large consumers. Upturn in consumer goods sales was evident several months before appreciable improvement in capital goods.

Electric refrigerator sales, for example, were 42 per cent lower in the first ten months of 1938 than in the corresponding period of 1937. Steel ingot production, however, was 54 per cent lower, and automobiles, heaviest steel consumer in 1937, were off 57 per cent.

Other household appliance sales were 25 to 45 per cent below 1937, a record year. Washer sales were 37 per cent lower; ironers, 44 per cent; vacuum cleaners, 27 per cent; and electric ranges, 37 per cent.

Whether 1939 will be a good year or only a fair year depends largely on the course of general business. However, it is interesting to note that most of these appliances made the greatest growth through depression years. Since 1928, electric refrigerators in use have increased from 1,250,000 to 11,250,000; radios from 7,500,000 to 26,500,000; electric ranges from 250,000 to 2,000,000; electric cleaners from 9,000,000 to 11,000,000. Normal replacement of these items promises a sizeable market.

In addition a new farm market is being created by the rural electrification program. Of the country's 6,400,000 farms, only 20 per cent or 1,300,000 are wired. The government's rural electrification program contemplates making electricity available to 200,000 more a year for the next eight years. Private utility companies also are extending lines through rural areas, thus making possibly 300,000 farm homes potential virgin markets for electrical appliances every year.

Stoker and air conditioning manufacturers enter 1939 confidently. Stoker production in 1938 was only about 10 per cent below the all-time high in 1937 and almost 100,000 units, mainly for residential and apartment house use, were

sold. A period of unusually mild weather in the fall and early winter throughout the stoker marketing area held down sales in what usually is the peak season.

"Manufacturers are laying their plans on a basis to increase the 1939 business by 25 per cent over 1938," says Marc G. Bluth, secretary, Stoker Manufacturers' association, Chicago.

"All indications," says Mr. Bluth, "point to a much more satisfactory year, taking advantage of the expected increase in building and the improvement in general business conditions."

Air conditioning manufacturers view 1939 as the year in which their industry really will don its "first long pants," according to P. Y. Danley, Westinghouse Electric & Mfg. Co. He expects the expansion to be directed toward apparel shops, markets, offices, hospitals, theaters, restaurants, schools, depots, beauty and barber shops.

"And we certainly won't have to worry about saturation in this market for many years," he comments.

An important advance made in marketing air conditioning equipment is the so-called package unit for contractors. This unit has all refrigeration connections, internal wiring, piping of refrigerant and the like, factory built and tested. Manufacturers claim the packaged units will facilitate distribution, enable lower-cost installations, and standardize manufacturing operations.

It is believed unlikely, however, that air conditioning can ever be sold as a packaged unit in the same sense a refrigerator is a packaged unit.

This year is expected to bring the first major revival in oil and gas construction since the 20's. Important expansion and modernization programs have been announced by major companies; some already are under way.

Harbinger for better times in the petroleum industry is the favorable acceptance accorded 1939 automobiles, presaging increased domestic gasoline consumption. American Petroleum institute estimates the increase will be 4 per cent over 1938.

An oil refinery's life is comparatively short due to petroleum's corrosive action. Constant demand for better fuels has brought about improvements with great rapidity, and installed equipment soon becomes obsolete.

Following the heavy expansion of the 20's, during which oil, gas and water requirements took an average of 9 per cent of total finished steel production, the oil industry held construction programs at low level during depression years. The result is accumulated obsolescence and need for replacements that can little longer be deferred.

Favorable financing conditions and assurance of a sustained market will bring a large part of the modernization this year.

Although major pipe lines last year were operated at less than capacity, there was some new construction, mainly gathering lines. A fair tonnage of steel will be used in additions contemplated this year.

Railroad freight rate increases and a narrowing marketing margin on petroleum products has stimulated interest in low-cost water transportation. Barge and tanker construction was active last year and a number still are under construction or on the planning boards.

Shipbuilding and aircraft construction for both national defense and commercial purposes are on their way to become more important steel and metal consumers.

American Bureau of Shipping reported vessels under construction Nov. 1 had gross tonnage of 459,775, compared with 315,220 tons on Nov. 1, 1937, an increase of 46 per cent.

The maritime commission's program to build up the merchant marine by constructing 50 ships a year for the next ten years came out of the planning into the construction stage during last year.

Also to take substantial steel tonnages over the next several years is the navy program. Six capital warships, costing about $70,000,000 each, are under con-

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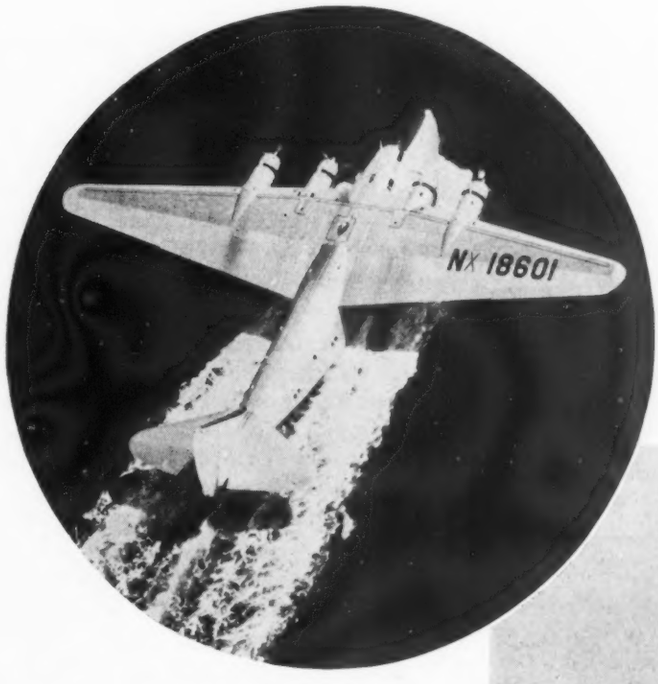

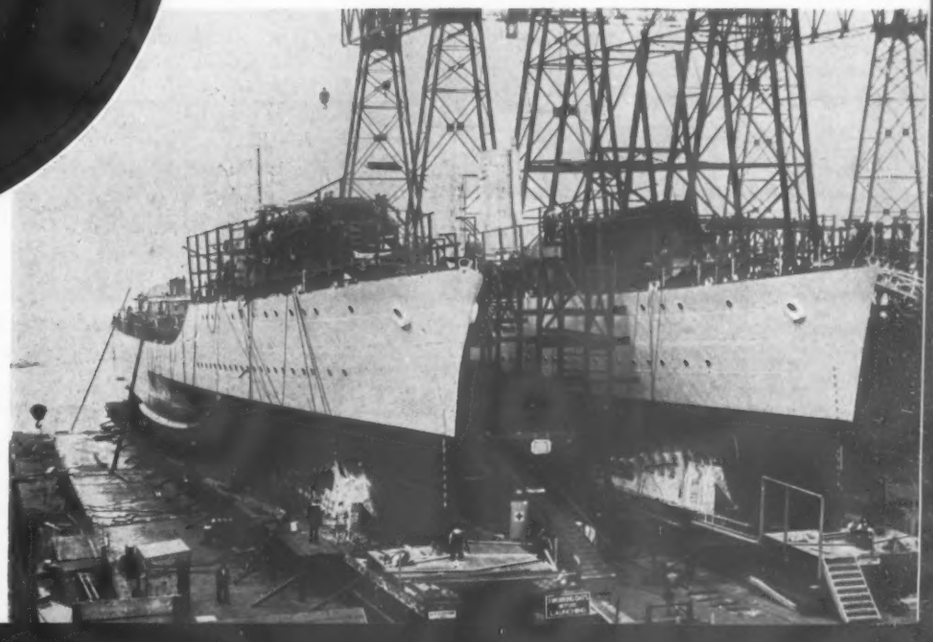

■ **Aircraft and shipbuilding, spurred by the national defense program, are expected to take near-record tonnages of steel and other metals in 1939. Aircraft production may set an all-time high; shipbuilding will be more active than in any year since the World war. Above, the 41-ton Boeing clipper. At right, two destroyers building in an eastern shipyard**

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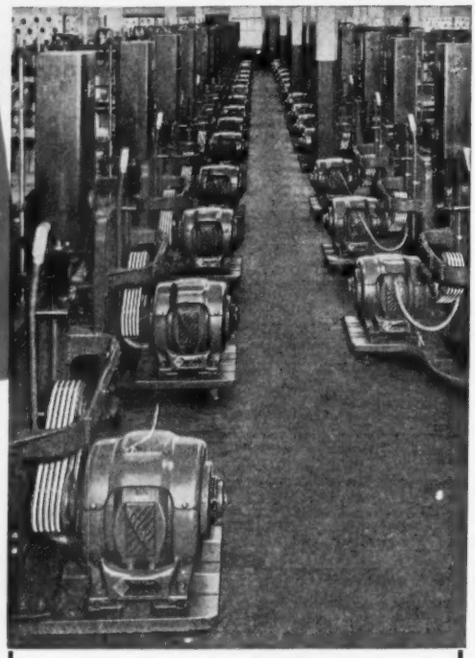

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Windows of WASHINGTON

BY L. M. LAMM
Washington Editor, STEEL

WASHINGTON

■ STEEL, and American industry generally, can look forward to 1939 with much more hope than for several years. This is due principally to the conservative trend in the November elections. The administration may be reasonably expected to slow down on radical reform; if not, a more conservative congress may prevent passage of such measures.

However, the President, if he wishes, can easily harass industry through existing governmental agencies, such as the department of justice, the federal trade commission and like bodies.

In accordance with the twentieth, sometimes known as the lame duck amendment, the 76th congress convenes Jan. 3. Before enactment of this amendment, there was always what was termed a short and long session of congress. Now, however, the sessions, other than specials, always convene Jan. 3.

The new congress' slate is clean as no bills or resolutions are carried forward from the previous year.

Many matters of particular interest to the steel and other industries are to come before the new session. As the personnel of both houses will be materially changed, new ideas will be written into many bills and resolutions. In addition, old members returning to Washington have their pet hobbies; year after year, the same bills are thrown into the congressional hopper, many of them being immediately pigeon-holed in committee.

Tax Revision To Be Considered

Among important questions to be considered is tax revision. A special committee of members of congress and treasury department experts has been working on the tax question for many months, and will present ideas for consideration by the house ways and means committee. There has been much talk about proposed tax changes, but this has been largely guess work because experts have not yet really gotten down to brass tacks.

The 76th congress is of particular interest to industry because of the November election results. While the President has expressed himself at recent press conferences as not worrying about any coalition between conservative Democrats and the new Republican membership, there is no question in the minds of the politicians but that the whole situation has been changed insofar as the President's control is concerned.

The Democrats have a large majority with which to work in both the senate and house, but this is far from saying the New Deal has such a majority. There are many Democrats who do not see eye to eye with Mr. Roosevelt; there are many more who did not agree with him during recent sessions of congress. Some of the latter remained on the side lines when they saw no chance of blocking the President.

With the additional Republican membership, the whole situation changes. The President will have to handle congress with kid gloves if he hopes to accomplish anything during the coming two years.

The President has informed the press he does not believe the recent election results were a "Stop" sign for liberalism—but there is no doubt the conservative gains meant "Slow Down." This is believed to presage the retarding or even abandonment of any radical New Deal legislation.

Armament Tax Suggested

In connection with taxes, the latest news from some administration leaders is that a special tax will be invoked to take care of the proposed increased armament plans and the additional appropriations that will be necessary to carry out the ideas of the President and the war and navy departments.

Many suggestions as to the vast armament program and an additional billion dollar appropriation for rearmament have been talked about by Washington officials.

During the last session of congress, a bill was passed authorizing the expenditure of $10,000,000 for so-called educational orders for the war department to be spent at the rate of $2,000,000 a year for five years. This bill provided the army was to farm out orders to various industrial organizations who are equipped to make specific war material.

Senators O'Mahoney and Borah, both of whom are members of the national economic committee investigating the monopoly question, have stated they fully intend to re-introduce their joint bill for federal licensing of industry. Hearings were held on this bill during the past session. It was generally opposed by industry. It was felt, at one time, this bill might not be pushed in view of the monopoly investigation being made by the economic committee, but evidently the two senators want to keep it before the public, regardless of what the committee is doing.

Another bill which will be reintroduced would provide for compulsory licensing of patents. This bill

last year caused considerable interest and undoubtedly will again. It is a particularly live subject because the patent situation also is pending before the economic committee.

Limitation of scrap and "essential" metals exports unquestionably will be proposed again.

Bills introduced during the last congress dealing with collusive bidding in connection with steel and other products, probably will be reintroduced. The national economic committee is studying this question now.

During 1938, B. F. Fairless, president, United States Steel Corp., and Walter S. Tower, executive secretary, American Iron and Steel institute, appeared before the senate committee on unemployment to discuss steel prices and the employment situation. A congress rarely passes without someone from the steel industry being asked to appear before some committee.

As the result of retirements, deaths, primary and election defeats, there are nearly 100 committee vacancies which must be filled this year. Considering the fact that the same political party still is in power, this is believed to be a precedent.

Sabath Slated for Rules Post

Probably the most important of these positions is that of chairman of the powerful house rules committee which was held last year by Representative John J. O'Connor, New York. He was defeated in the Democratic primaries, and again when he ran on the Republican ticket. Had he won his seat as a Republican, he still would have lost the chairmanship of this committee. It is expected that Representative Sabath, Illinois, will get the post.

Representative Bankhead, Alabama, probably will continue as speaker of the house, and Representative Rayburn, Texas, as majority leader.

While there has been some discontent with the Democratic leadership in the senate held by Senator Barkley, Kentucky, it is believed that he will again be majority leader while Senator McNary, Oregon, will continue as Republican leader in that body.

There are six vacancies on the important house ways and means committee, five vacancies on the appropriations committee, two on the banking committee, two on the foreign affairs committee, and three on the agricultural committee.

Chairmanship of the senate commerce committee, vacant due to the death of Senator Copeland, New York, should go to Senator Bailey, North Carolina, by reason of seniority. There are two vacancies on the senate agricultural committee and the chairmanship of the patents committee of the senate is also vacant due to the primary defeat of Senator McAdoo, California.

Several times during the past year the President—or some of his henchmen—has approached industry asking co-operation between business and government. Similar approaches will doubtless be made this year.

Small businessmen came to Washington last year in an effort to gain some recognition from government. They gained nothing by their pilgrimage. Some small businessmen's organizations were brought into being, none of which has developed any definite program.

Representatives of small business tried to gain representation on the Roper business advisory council which is composed of the big fellows. Secretary of Commerce Roper said that he would be glad to have representatives of small business on the board—but there the matter ended.

The Roper council has not done anything of importance during the past year, and probably there will be nothing outstanding this year.

More interest attaches to the work of the national economic committee than to that of any other government investigation. It is practically impossible to predict what this committee will bring forth in 1939.

Literally, dozens of economists and would-be economists, in various government organizations are now working under the direction of the committee. On the surface at least, they are not making much progress, but committee officials contend that when all of the parts of the puzzle are put together, it will make a perfect picture.

It has been stated several times by committee members that a preliminary report will be made to congress probably in January. On the basis of accomplishment, the committee will have little to say but it undoubtedly will point out that more money is needed, and there has been talk also that it will suggest a permanent organization. Some members have suggested there should be an industrial economic bureau created to carry on the monopoly investigation. Some believe that it is rather futile for the organization to go into the antitrust situation inasmuch as it is a job that cannot be handled in a few months.

It will be recalled this temporary committee is composed of three members of the senate appointed by the vice president; three members of the house appointed by the speaker; and one representative each from justice, treasury, commerce, and labor departments, federal trade commission and the securities and exchange commission.

Provision was made in the act creating the committee for a preliminary report before the first session of the 76th congress, the one just beginning, or as "soon thereafter as possible." Also during or before or at the termination of this congress a final report is to be made. That means the committee still has a couple of years to run, unless some other legislative provision is made in the meantime. It is believed here that some further legislation will be passed before that time. Actual provision in the act is that "all authority conferred by this joint resolution shall terminate upon the expiration of the 76th congress."

Committee To Probe Steel Industry

Sooner or later the steel industry will come up for discussion and investigation by the committee. The department of justice and the federal trade commission have been preparing questionnaires for the industry which when tabulated will be turned over to the committee.

It must also be remembered that the federal trade commission officials who are represented on the committee have always opposed a basing-point plan, and at every chance have made public statements against such systems. Nothing would please the commission more, it is believed, than to put the steel industry in the witness chair and make it uncomfortable. Changes made last year in this system, however, may draw the commission's stinger.

Another government agency in which the steel industry is vitally interested is the national labor relations board—and well it might be, considering the grief that organization already has caused.

Still pending are final adjudications by the board in its complaints against the Republic Steel Corp., the

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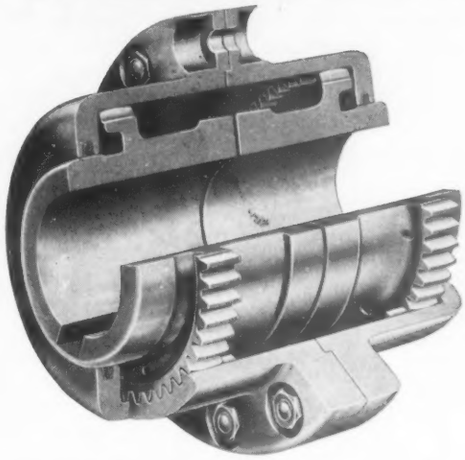

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Weirton Steel Co. and the Inland Steel Co. These cases have been pending for many months.

The labor board is going to face a tough time, it is believed, at this session. There are many on Capitol Hill who have opposed its attitude, toward the CIO in particular, and its methods and administration in general.

During the summer, President Roosevelt gave Donald Wakefield Smith a recess reappointment in the face of severe opposition by the American Federation of Labor. However, he has to be confirmed by the senate. The AFL has stated officially it will oppose his confirmation in the senate, and it will be much easier for that organization to work on the senate than it was to work on the President.

There is no need to rehearse the biased and unfair attitude the board has taken toward industry. There is every indication it will continue present tactics. There have been many demands for amendments to the labor act, and some change during this session is possible.

The hours and wages law will necessitate hour and wage adjustments by some industries during the present year.

The act became effective Oct. 24 with a 25-cent per hour rate, which is to be increased at the end of the first year, or on Oct. 24, 1939, to a 30-cent hourly rate to be continued for the next six years. During the first year, also, the 44-hour week was in effect and beginning on Oct. 24 this year, the work-week will be decreased to 42 hours. This differs from the wage situation, however, inasmuch as the 42-hour week is only to be effective "during the second year." At the end of that time, provision is made for a 40-hour week.

Up to this time, the wage-hour law has not bothered the steel industry and it is not likely to except in isolated instances. Some allied industries, however, have been affected.

Administrator Andrews has stated he will ask congress for a deficiency appropriation, to be available at once. He is going to have a difficult time administering this law, in view of the small enforcement personnel.

The Hull trade agreement program has gone steadily ahead during the past year. There is no doubt the administration is thoroughly sold on this type of tariff.

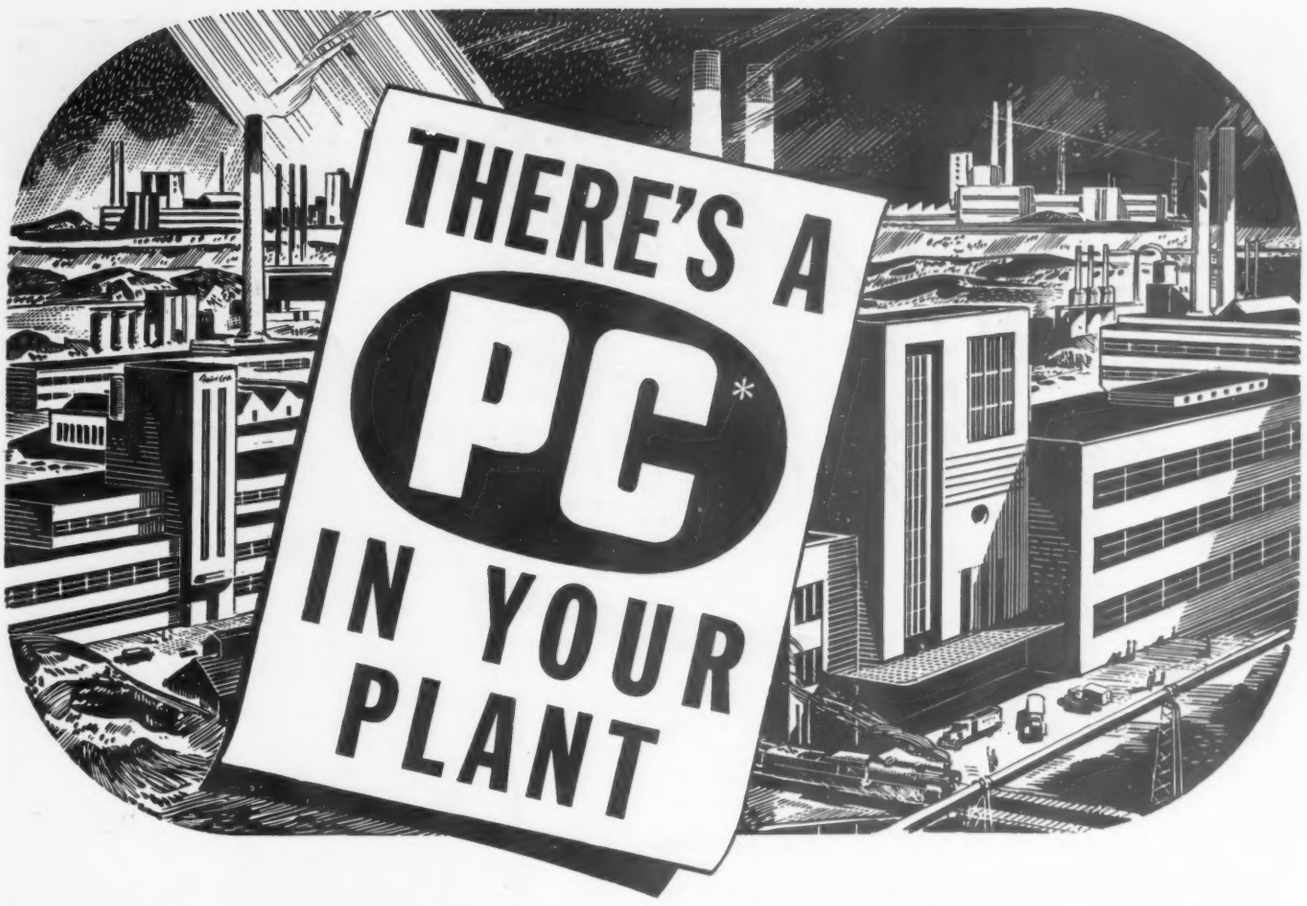
Many who have watched the tariff situation in Washington closely for years believe the trade agreement system better than the old log-rolling tactics practiced by congress.

Unless something unforeseen develops, there is every indication the trade agreement program will be carried on during 1939. Secretary of State Hull, who is the father of the trade agreements, is more sold on the idea than ever.

In November the trade agreement between the United Kingdom and the United States and a renewed agreement between this country and Canada were signed. The United Kingdom agreement was one on which Hull had set his heart, but it came near falling by the wayside. Several times an impasse was reached, but the final hurdle was taken. Several other agreements probably will be signed this year.

The administration will attempt to negotiate an agreement with Canada for joint development of the St. Lawrence for navigation and hydro-electric power. The project will be bitterly opposed by many groups, including inland steel producers and the Lake Superior iron ore industry.

■ **Still symbolizing America's basic principles—the flag, and United States Supreme Court**



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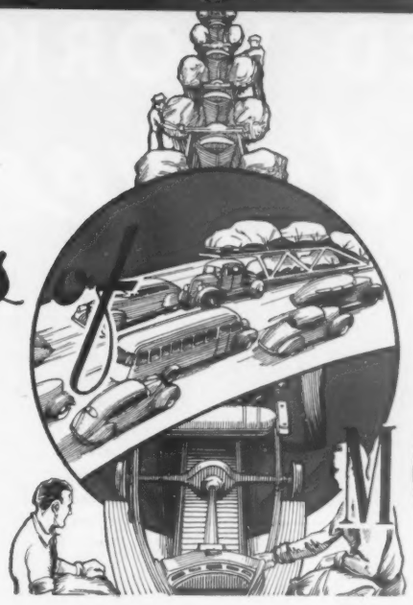
Mirrors of MOTORDOM

BY A. H. ALLEN
Detroit Editor, STEEL



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DETROIT

■ AS AUTOMOTIVE history for 1938 is written, the amazing drop in production from better than 5,000,000 cars and trucks in the year previous to a little over half that number transcends all other developments. Only a remarkable recuperation in output during November and December prevented the year from sagging almost to the low ebb of 1932 and 1933.

It was no surprise to the industry generally that this staggering slump was on its way, although some may have underestimated its severity. However, as early as November, 1937, the storm warnings were hoisted by sales departments and plants began preparing for rough weather ahead. That this planning was well considered is now apparent, for the industry came through to the fall of 1938 with dealers' stocks near the vanishing point, and retailers were set to receive the rousing fall demand which developed for 1939 models.

The question suggests itself: What caused the 50 per cent drop in auto sales last year? Scanning production records clear back to 1900, in no single year has there occurred such a precipitate skidding in output. Why?

Some statisticians see a perfectly obvious answer. They go back to the fall of 1936 when the first rumblings of labor trouble were being heard throughout American industry. Factory payrolls were climbing and climbing rapidly, partly as a result of an effort to forestall oncoming labor trouble and partly because better business was being generated from speculative buying by consumers, merchants and manufacturers themselves.

Expansion Developed Rapidly

The three latter groups were reading the handwriting on the wall—the handwriting of John L. Lewis and his militant Committee for Industrial Organization, bulwarked by a kindly New Deal in Washington. They were stocking up on goods against the probability of skying prices and crippling strikes. The strikes came; the high prices only half came.

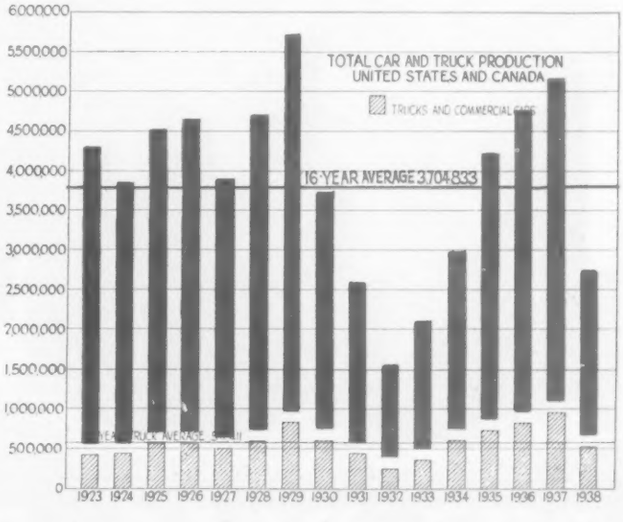
In the three years from December, 1934, to December, 1937, manufacturing inventories increased by 175 millions of dollars, dealer inventories mounted by nearly 300 millions of dollars, and consumer inventories (of automobiles)—mark this well— leaped by 1218 millions of dollars.

Little wonder then that factory payrolls in the 18 months preceding July, 1937, soared from an index number of 81 to 102. Little wonder that employment in automotive and automotive parts plants in 1937 had crept up to the all-time high of nearly 500,000 men, receiving wages of $756,000,000, increases of 24 per cent and 39 per cent, respectively, over 1935.

And these thousands of factory workers lost little time in going out and buying automobiles with their new-found wealth. Practically all reputable surveys of the proportion of new car sales going to various occupational groups show a sharply rising curve for factory workers from 1935 until the middle of 1937.

Other groups—farmers, merchants, professional people—kept on fairly even keel, but the percentage of cars purchased by factory workers angled up across other lines, and this even in spite of the fact that the total volume of sales was expanding rapidly at the same time.

So we see a speculative boom in process during



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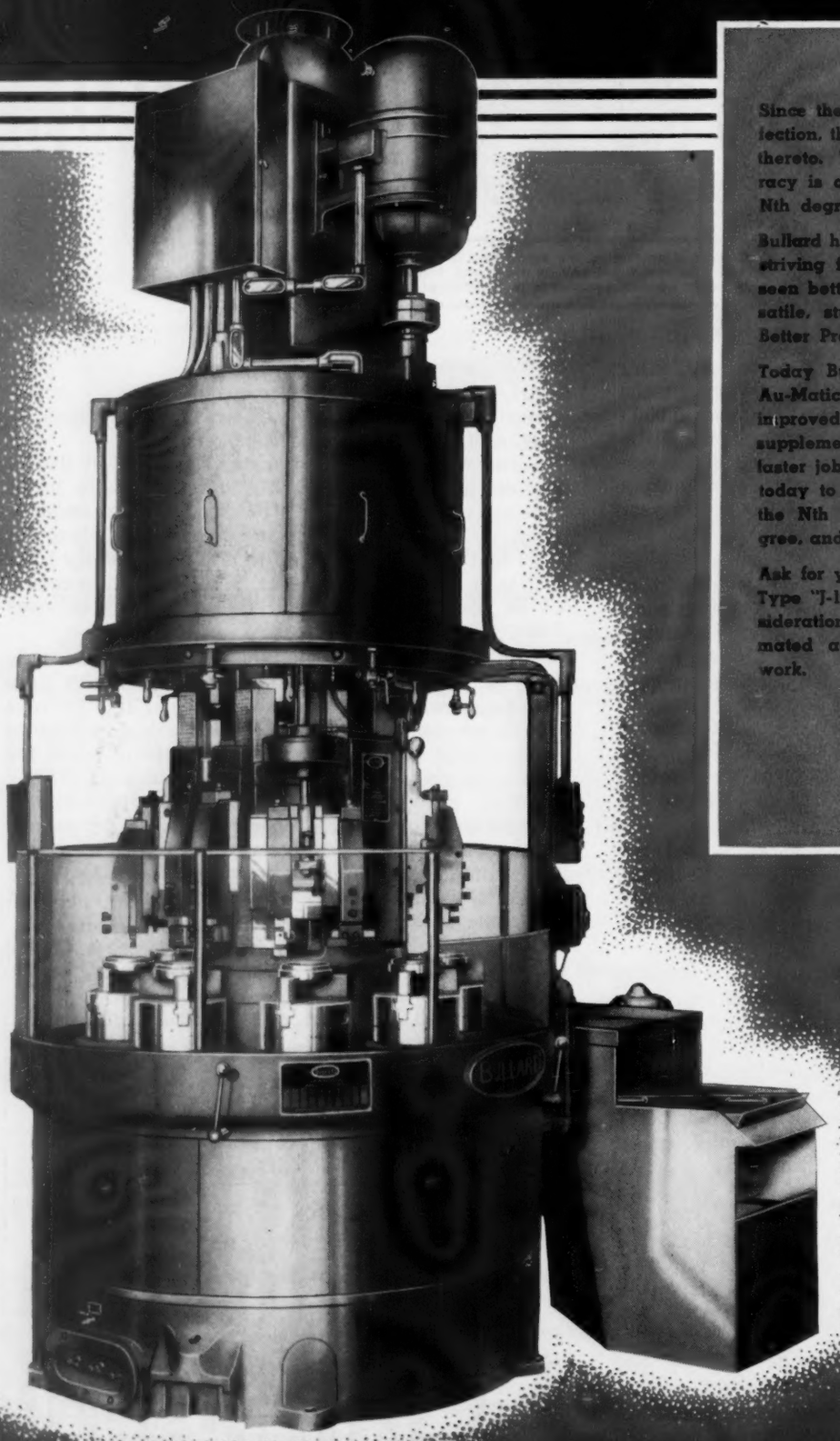

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1935, 1936 and reaching a peak in 1937. Suddenly, in the late summer of 1937, the bubble burst. Layoffs started in automobile plants because of the overloaded condition of inventories, particularly consumer inventories. Laid-off workers can buy no automobiles, so new cars began to go begging. Factory payrolls started to slide in company with nearly all other indexes of production.

By October of last year they either had hit bottom or had taken a temporary bounce; in any event they are now resuming an upward path.

Summing up this briefly sketched rise and fall of American industry leads to the belief that the collapse of 1938 can be explained solely by the labor policy of the federal government and the fulminations of the CIO. Without them the incentive to expand inventories against higher wages and higher prices would have been lacking.

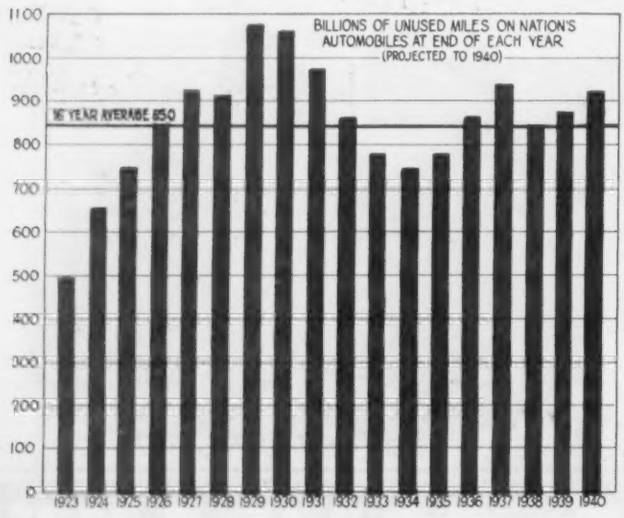
Whither away this year? Well, the only definite expression of opinion on the subject of automobiles to be heard is that the year will be better than 1938 —by how much it is difficult to say. Estimates range from 25 to 50 per cent. If you are interested in a prediction, a figure of 3,500,000 cars and trucks for 1939 is suggested, or about 35 per cent above the estimated 2,600,000 total achieved in 1938.

The industry's statisticians, among them John W. Scoville of Chrysler Corp., express the belief the automobile industry is now in its maturity and from here on may grow wiser but will not grow much bigger. In support of this belief, examine the accompanying chart of automobile production since 1923, the year when the industry is considered to have attained its maturity.

Normal Output: 3,700,000 Cars, Trucks

Through 1929 it appeared the trend of output was slanting upward at a rate of about 300,000 units annually. But the ensuing six years belied this trend, and after averaging in the downfall of 1938 the industry appears to be operating on a normal level of around 3,700,000 cars and trucks annually, figuring in Canadian production as well.

This is not to infer there will be no more 5,500,000-car years, or no 6,000,000-car year. Unquestionably these totals will be reached sometime in the future, perhaps even eclipsed, but only at the sacrifice of some other future year when, as in 1938, a great deficiency will appear to bring down output to the norm.



Population of the country is steadily expanding and the network of good roads is finer every year, indicating no lack of outlets for more cars, but it is doubtful whether the normal level of annual automobile production will be much over the 3,700,000 figure for the next 5-10 years, although gradual growth over a long period of years might logically be expected.

The following table relates population to motor vehicle registrations, with final figures for 1938 still subject to revision:

Year	Population United States	Registration All Motor Vehicles	Ratio of Population per Vehicle
1925	115,378,000	19,937,274	5.78
1926	117,136,000	22,001,393	5.32
1927	118,628,000	23,133,243	5.12
1928	120,013,000	24,493,124	4.90
1929	121,500,000	26,501,443	4.58
1930	122,775,000	26,545,281	4.62
1931	124,070,000	25,832,884	4.80
1932	124,822,000	24,115,129	5.17
1933	125,693,000	23,843,591	5.27
1934	126,425,000	24,933,403	5.07
1935	127,172,000	26,230,834	4.86
1936	128,429,000	28,221,291	4.55
1937	129,257,000	29,705,220	4.35
1938*	130,215,000	28,800,000	4.52

*Estimated as of September, 1938.

Thus, in the last 12 years the number of motor vehicles operated has kept pretty close step with the country's population, although in bad times, as might be expected, a good many automobiles fall into disuse. With 70 per cent of the world's registered motor vehicles operated in the United States, this country now has one passenger car for every five inhabitants.

A second accompanying chart is an interesting analysis of the unused mileage on cars at the end of each year, based on data prepared by Mr. Scoville of Chrysler.

At first glance it would appear impossibly difficult to assemble such data, but by assuming the average car delivers 75,000 miles of transportation in its lifetime, and relating this to such factors as number of new cars sold, total registrations and number of cars scrapped, it is possible to arrive at a reasonably accurate figure of unused mileage, and it is even possible to project this figure for a couple of years as has been done on this chart.

Automobile's Life Extended

It will be noted that as new car production rises, the unused mileage figure also rises, though not nearly as abruptly. Forecasts for 1939 show unused mileage at the same figure as for 1938, with a 35-point rise indicated for 1940. Related to production, this would suggest a moderate increase this year, followed by about a 40 per cent increase in 1940, bringing output for the latter year to possibly 4,500,000. But so many uncertainties crowd the future outlook it is difficult to do any accurate crystal-gazing, even with the help of such a good index.

Mr. Scoville's staff has done a considerable amount of valuable research on the relation of automobile sales to the national economic health, and vice versa. Car sales have been found to follow closely the course of that part of the national income in excess of 35

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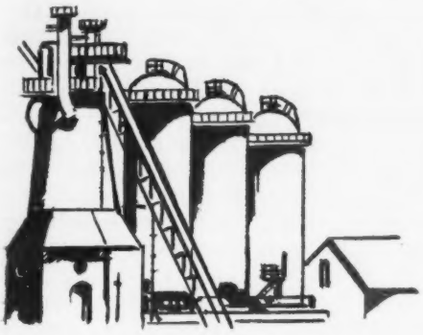

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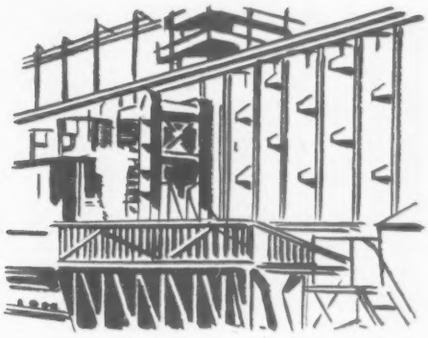

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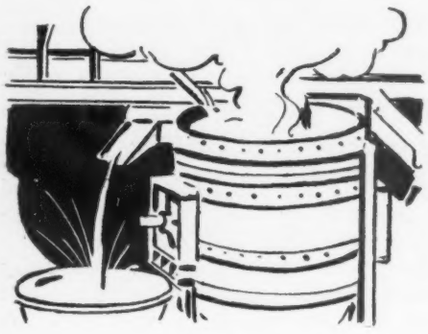

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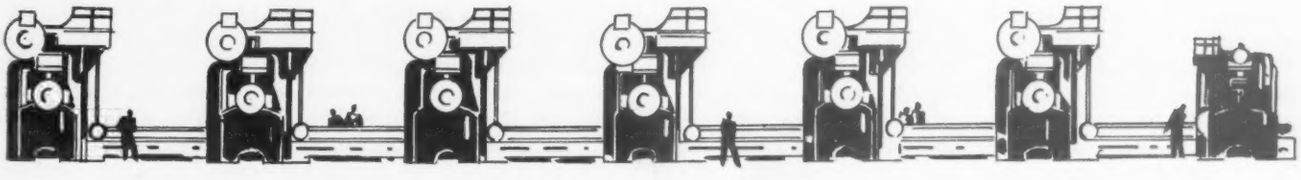

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SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES STRUCTURALS PILING RAILS TRACK ACCESSORIES REINFORCING BARS

billions of dollars. Further, automobile production bears a direct relationship to the total number of cars in use, or consumer inventories of automobiles. Statistics show that a 3 per cent change between high and low points of consumer inventories is accompanied by a 40 per cent change in automobile production, over a period of five years.

Research also shows a steady lengthening on the average life of a car, now figured to be about 9¼ years. As recently as 1926 this period was only 7 years, attesting to the considerable improvement which manufacturers have been able to achieve in the sturdiness of their product, and further reflecting the able assistance of materials suppliers and equipment builders. Reports show average life of British-built cars to be still only 7 years plus.

■ TABULATED data show the steel industry to continue its 20 per cent "stake" in the automobile industry. Starting with the maturity year of 1923, statistics show:

Year	Car and Truck Production in United States	Automobile Consumption of Finished Steel % of Output	Gross Tons	Apparent Lbs. Finished Steel Per Car†
1923	4,033,248	10.59	3,524,042	1914
1924	3,605,206	11.37	3,193,427	1943
1925	4,265,830	14.60	4,874,496	2517
1926	4,300,934	15.09	5,356,330	2736
1927	3,401,326	13.34	4,386,062	2829
1928	4,359,087	17.76	6,688,934	3375
1929	5,359,090	17.57	7,251,896	2976
1930	3,356,806	14.10	4,161,334	2726
1931	2,389,800	14.78	2,834,197	2618
1932	1,370,678	18.15	1,896,856	3050
1933	1,920,057	20.95	3,505,982	4052
1934	2,753,111	20.87	3,984,830	3195
1935	3,946,934	24.04	5,005,784	2792
1936	4,454,115	20.87	6,068,187	3011
1937	4,808,974	20.04	6,553,506	3004
1938 (Est.)	2,500,000	20.00	3,423,000	3000

†These figures have been revised completely, taking into consideration the fact about one-half gross ton of steel made in the United States goes into the manufacture of each car produced in Canada. Unit consumption of steel is figured by multiplying gross tons of automobile steel less allowance for Canadian assemblies by 2240 pounds and then dividing by car production in the United States. Obviously the wide fluctuations in the final figure are not due to any sudden shift in the amounts of steel used per automobile; rather they reflect the changing tonnages going into replacement parts and other related automotive equipment included by steelmakers in their estimates of output of "automobile steel." It does appear significant that since 1934 the amount of finished steel per car has been fairly static at about 3000 pounds. Various estimates by automobile companies show the actual amount of steel in the average automobile to be in the range of 1900-2200 pounds.

Judging from the design of most cars today, the trend is toward less weight of steel per car. In one line of bodies, for example a 14 per cent increase in glass area was effected, naturally at the expense of body steel. Increasing emphasis being placed on vision for safety's sake, while demands for less weight and the inroads of molded plastics are tightening the competitive picture for steel in automobiles, although it continues to be far and away the No. 1 metal in use.

Backward glance at the chronology of the auto industry for 1938 reveals more than a few happenings worthy of inclusion in the record. Grouping them under headings of subject matter rather than date of occurrence perhaps will give a more coherent summary.

■ DESIGNS: Early in the year much discussion was heard of plans for new small cars, aimed to coax dollars from buyers in low-income groups where new car sales had suffered the most. Ford did considerable experimental work on a small 105-inch wheelbase car but this project by midyear was dropped. Nash had sample models built of a similar small job, with production believed to be deferred until some time this year. Much was heard of the Crosley "jitterbug" car, designed to sell at around $350, but here again a skidding automobile market undoubtedly persuaded its proponents to await a more auspicious time.

Hudson introduced its 112 model about a year ago as a contribution to the smaller-car field, but this model is of standard proportions and, with the introduction of 1939 models, has succeeded the former Terraplane series built by Hudson.

Plymouth rechristened its lower-price series the Roadking and added several body styles.

Introduction of new models last fall disclosed a fairly complete redesigning of front ends, with two schools of thought apparent; one confining radiator grilles to two flanking catwalk grilles and no center venting, the other continuing the central grille in narrower and sharper form flanked by the smaller grilles in catwalks. Designers believe the next step will be to eliminate center grilles altogether, restricting ventilation to two low catwalk grilles, and eventually when engines are shifted rearward, even these will disappear.

Complete new body designs are numerous, featuring sloping backs, wider seats, greater glass area in windows and windshields, headlamps worked into fender contours and other minor refinements. As yet no builder has had the daring to include fenders as an integral part of the body itself, but this will come soon.

Mechanically, the most important change was the placing of gearshift levers on steering columns. Practically all producers have adopted this feature either as standard or optional equipment.

Continues Mechanical Shifting

This design continues the mechanical shifting of gears and indicates possibly that the several automatic and semiautomatic transmissions hitherto offered have not been entirely satisfactory. The fully automatic transmission is definitely on its way, but a workable form as yet has not been developed. A straw in the wind may be the fluid drive auxiliary transmission announced in December by Chrysler. This drive provides a gearless, infinitely variable transmission, but at present is offered only on one model in conjunction with the conventional clutch and gear transmission.

Pontiac has adopted the same type of clutch spring member as that introduced by Chevrolet a year previous—a stamped steel disk with a series of radial fingers. Buick has worked out a somewhat different idea for this same member, a steel disk with a series of radial corrugations supplying the spring action.

Ford's switch to hydraulic brakes on 1939 models was an epochal event for this producer, and marked the virtual 100 per cent adoption of hydraulic brakes by American car builders.

Olds followed Buick's example of coil springs on rear wheels, although using a somewhat different stabilizing system. Pontiac introduced a variable-rate rear leaf spring, the first use of this type of spring on passenger cars.

Attempts to overcome initial wear in engine parts were crystallized in the adaptation of chemical surface treatments and heat treatment for such parts as rings, camshafts, valve tappets, etc., while Chrysler has brought about closer fits in engine assemblies

(*Please turn to Page* 264)

Now! THE PLYMOUTH FLEXOMOTIVE

Model KC 45 Ton Diesel-Powered Plymouth Flexomotive

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Here's What You Asked For—

First Cost Way below the diesel-electric type.

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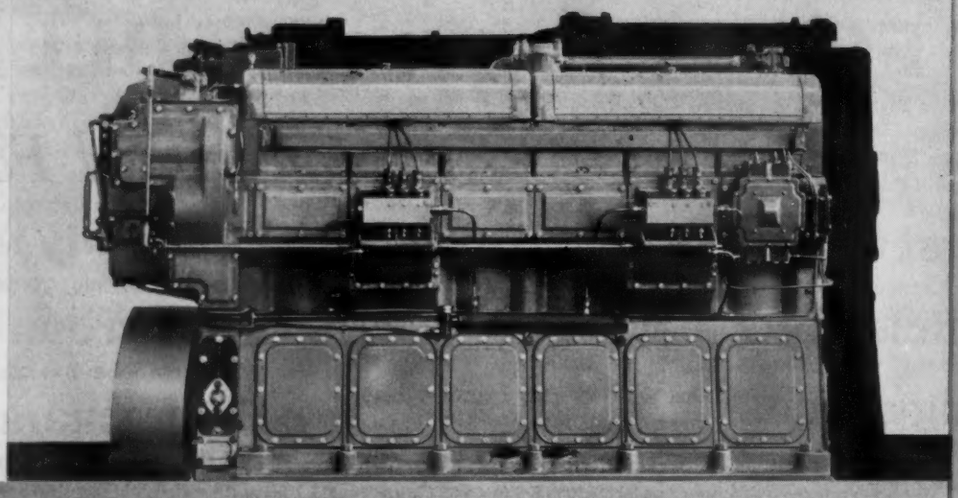

Cooper-Bessemer Type EN, 6-cylinder Diesel engine which powers the new 45-ton Plymouth Flexomotive.

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What's Available in TECHNICAL PROGRESS ?

Presentations covering major developments in industrial equipment, materials and processes which are available as the metal producing and metalworking industries move into 1939:

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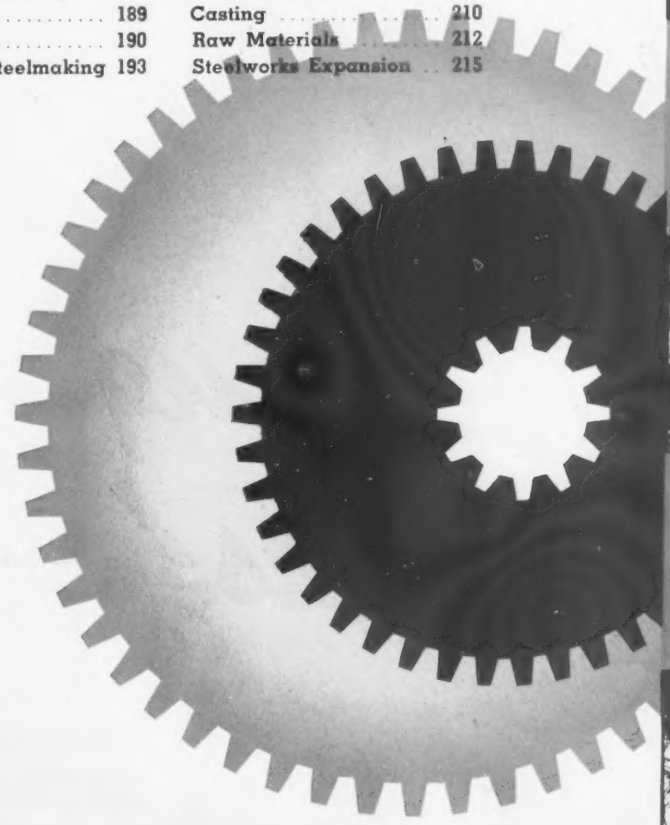

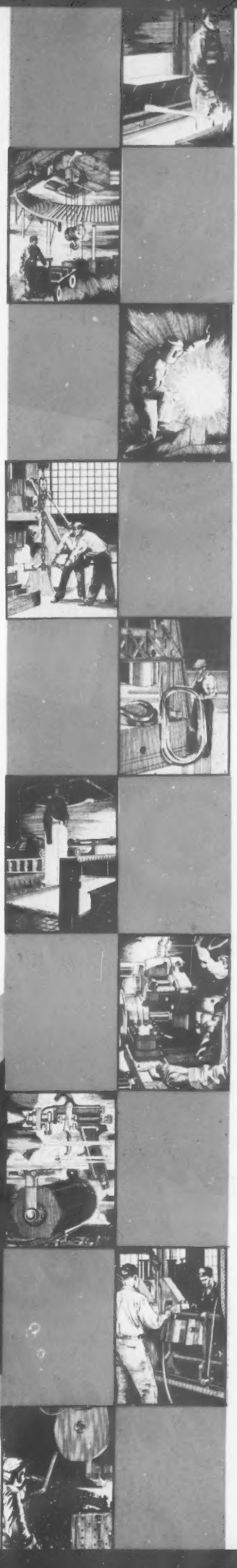

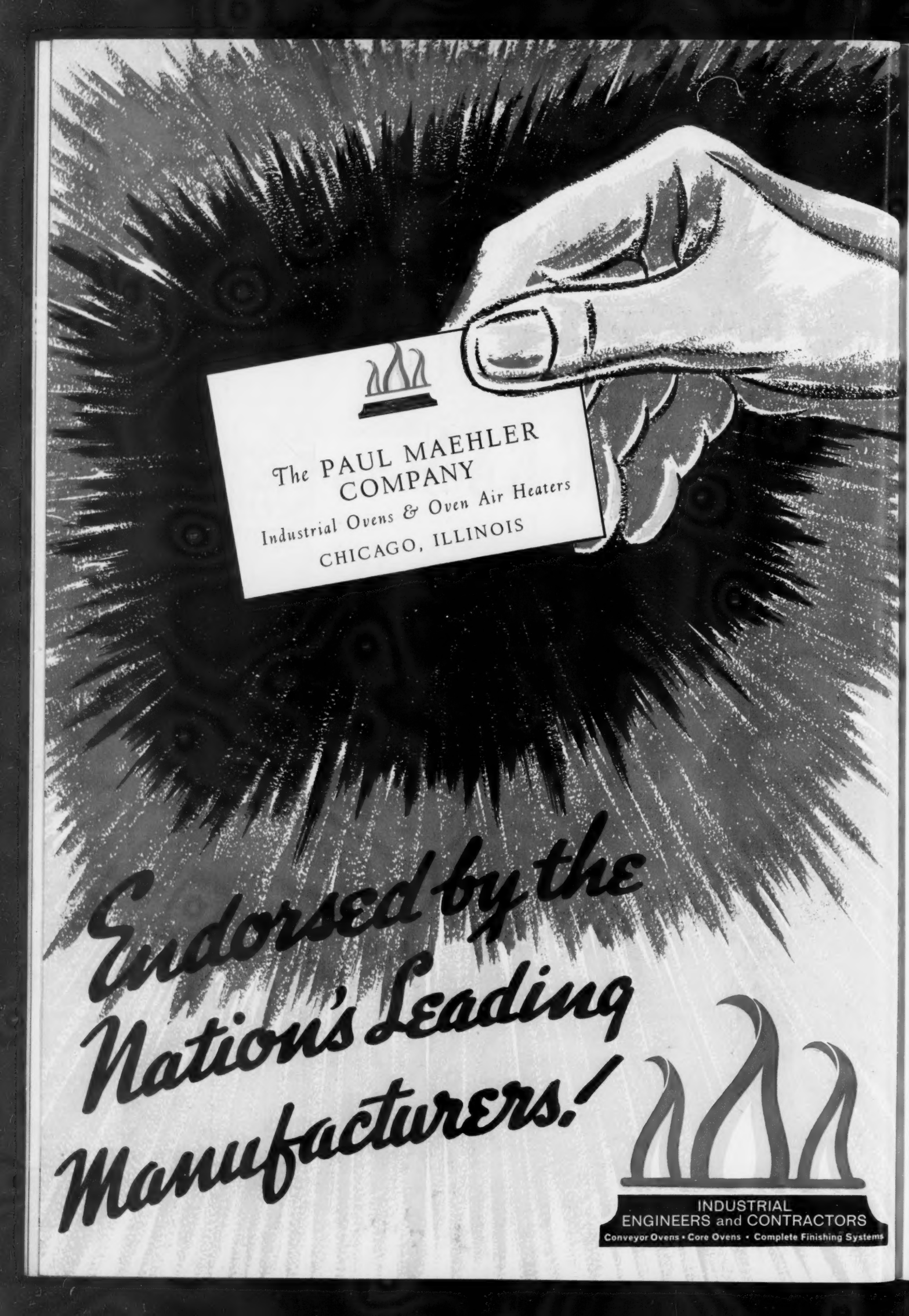
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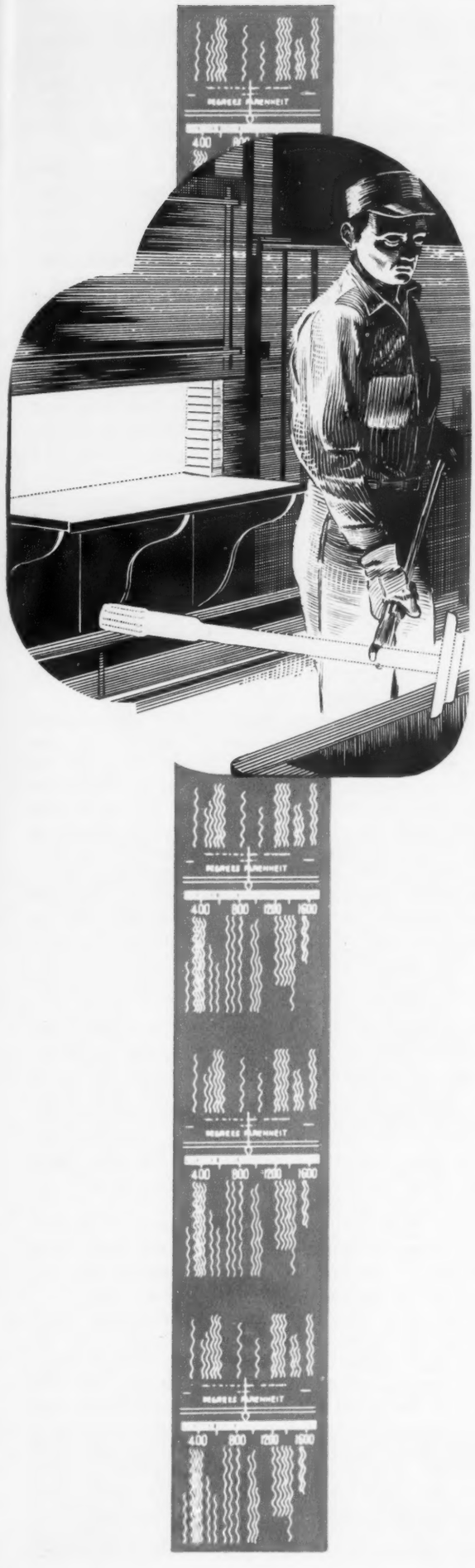


HEAT TREATING

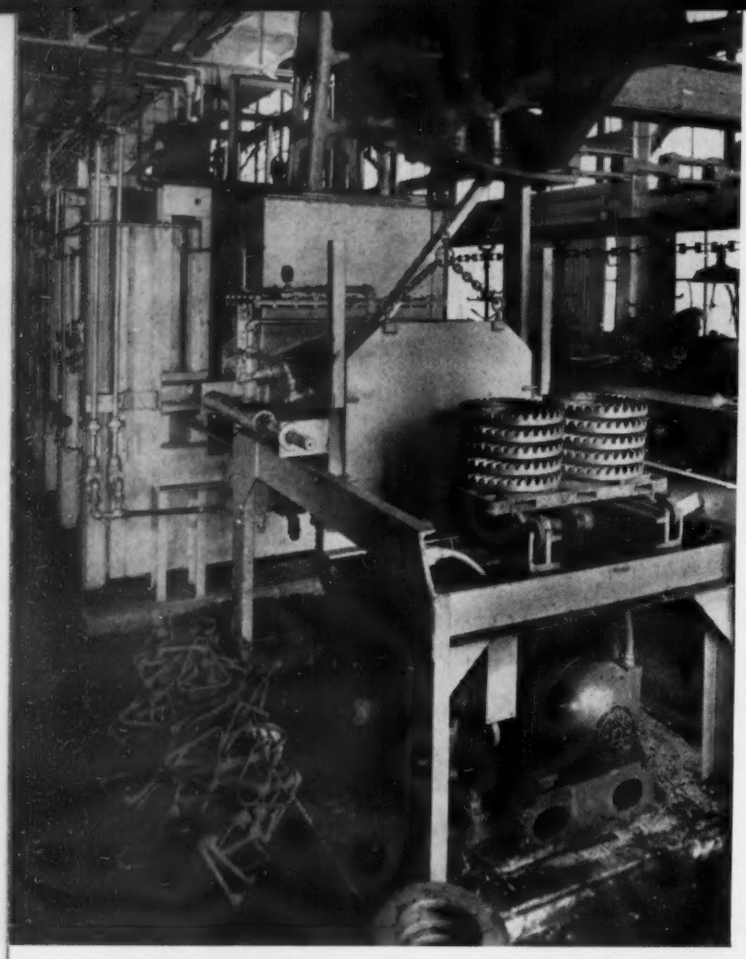
■ KNOWLEDGE gained in the field of heat treating during the past year will enable the metallurgist to handle 1939 production with greater skill, and thereby to derive maximum potentialities from the metals he treats. With a better understanding of gases has come a growing use of controlled atmosphere operations. The nature of hardenability is being explored and some of the variables being ascertained. Flame and induction hardening continue to grow in favor for an increasing number of applications. These are but a few of the recent developments; research is being pushed in all phases of the heat treating art and gives promise of progress yet to come.

More installations of gas carburizers are being made, observes E. F. Davis, metallurgist, Warner Gear division, Borg-Warner Corp., Muncie, Ind., who says later types automatically quench, wash and temper. One installation uses no alloy muffle, heating being accomplished by radiant tubes. There is a notable increase in installations using ammonia gas in addition to carburizing gas, producing a case with characteristics similar to that obtained by cyanide and activated baths.

Both high and low-frequency induction hardening increases, with many possibilities for the method yet to be probed. With the new small utility units for hardening, brazing and annealing small parts, it is possible to harden either the outside or inside diameter of a part, or locally harden or anneal any portion of a shaft, Mr. Davis points out.

Several new improvements have been made in furnace alloy mechanisms for conducting work through continuous furnaces. One development in connection with carburizing uses individual pots cast to contour of the part and utilizes a minimum of carburizing material. These pots are placed on pegs or lugs on continuous chains or other mechanisms. Carburizing time is greatly shortened. A disadvantage, in the opinion of Mr. Davis, is the large amount of alloy necessary to handle heavy production.

Centrifugal casting of steel gears is an important advance in gear metallurgy, he continues. This still is in process of development. Machinability of carbon steels



■ **A variation of gas carburizing, the new dry cyaniding process is finding increasing application for producing extremely hard, shallow cases. Photo courtesy Surface Combustion Corp.**

has been improved by small percentages of lead, the element appearing to have no effect upon physical properties and not interfering with hardenability. Experiments are being made to improve machinability of alloy steels by adding lead. Being a nonalloying impurity, lead probably would affect fatigue life similarly to manganese sulphide and other impurities.

Studies on hardenability of steel and its determination impresses G. T. Williams, metallurgist, Cleveland Tractor Co., Cleveland, as giving aid to the production heat treater by raising accuracy and reproducibility of results. Commercial uniformity is the goal; ideal hardenability characteristics may never be attainable for a given part, but closely similar response will follow use of steels of uniform hardenability, and best uniformity, both in distortion and mechanical properties, will be had. It appears certain that steel suppliers will further the adoption of standards of hardenability.

It is here, Mr. Williams thinks, that the steel user may look for the next gain in his effort to overcome variables in heat treating. Gain in percentage may be high, but will in fact be small numerically where advantages of grain size control, close analysis limits, furnace atmosphere and temperature control already are in use.

A particularly interesting improvement in carburizing gears has been made by a large manufacturer of axles and transmissions, Mr. Williams records. A center section of a long, continuous furnace was removed to provide an air gap; boxes containing gears in compound pass through the first portion where the usual carburizing is effected, then into the open section where they cool to a subcritical temperature, then back into the second section where the boxes and contents are reheated to the hardening temperature (1500 degrees Fahr.) and held long enough to give a thin, extremely high carbon surface to the normal case, then discharged and the work quenched.

Extreme surface hardness and wear resistance are attained, plus advantages of the usual carburizing. This, in the opinion of Mr. Williams is a most interesting procedure because of the adaption of existing equipment to the most advanced metallurgical processing.

Today, the consumer has available methods of analysis which enable him to specify just the kind of material and heat treatment he requires for a specific purpose, and it is up to the steel manufacturer and heat treater to produce it, says R. L. Rolf, metallurgical engineer, Lakeside Steel Improvement Co., Cleveland. Progress in heat treatment in recent years made 1938 the turning point toward mechanization of the industry.

The gas carburizing process is making tremendous strides. Mr. Rolf contends that yesterday belonged to the mechanical engineer but today and tomorrow belong to the chemical engineer whose ability to compound and handle mixed gases has led to development of furnaces with controlled atmosphere suitable for treating all types of steels which require nonoxidizing and nondecarburizing atmosphere. In this connection, dry cyaniding is gaining popularity for producing shallow cases.

Advantages of induction heating and the oxyacetylene flame have only begun to be applied to the service of man, he continues. Slight changes already are noticeable, for example, carbon steels are being substituted in many instances for more expensive alloys. Routing of work through plants is being modified to reduce costs and to expedite production because it is possible to completely finish parts prior to hardening. Flame carburizing of small and thin sections has begun to open a new field in the manufacture of business machines, Mr. Rolf points out.

Special Atmospheres Increase

R. J. Cowan, metallurgical engineer, Surface Combustion Corp., Toledo, O., also refers to the increased utilization of special atmospheres as one of the year's major developments. The process of continuous gas carburizing has been combined in fully automatic units that include a quenching, washing and drawing in succession. Progress also has been made in combining continuous nitriding with continuous gas carburizing to produce the new process of dry cyaniding. The range of properties thus made possible in a case hardened piece is not fully understood or utilized at present, Mr. Cowan emphasizes, but this matter is receiving considerable attention.

A number of gas generators of different types have made their appearance the past year, and, for the most part, these have been devised for heat treating high carbon steel. Mr. Cowan says it has been found that the usual DX gas will decarburize a steel containing more than 0.5 per cent carbon. One of the most effective of these generators is that which produces charges from charcoal; this gas containing approximately 30 per cent carbon monoxide with varying amounts of hydrogen and water vapor.

Increasing use of tool steel containing molybdenum

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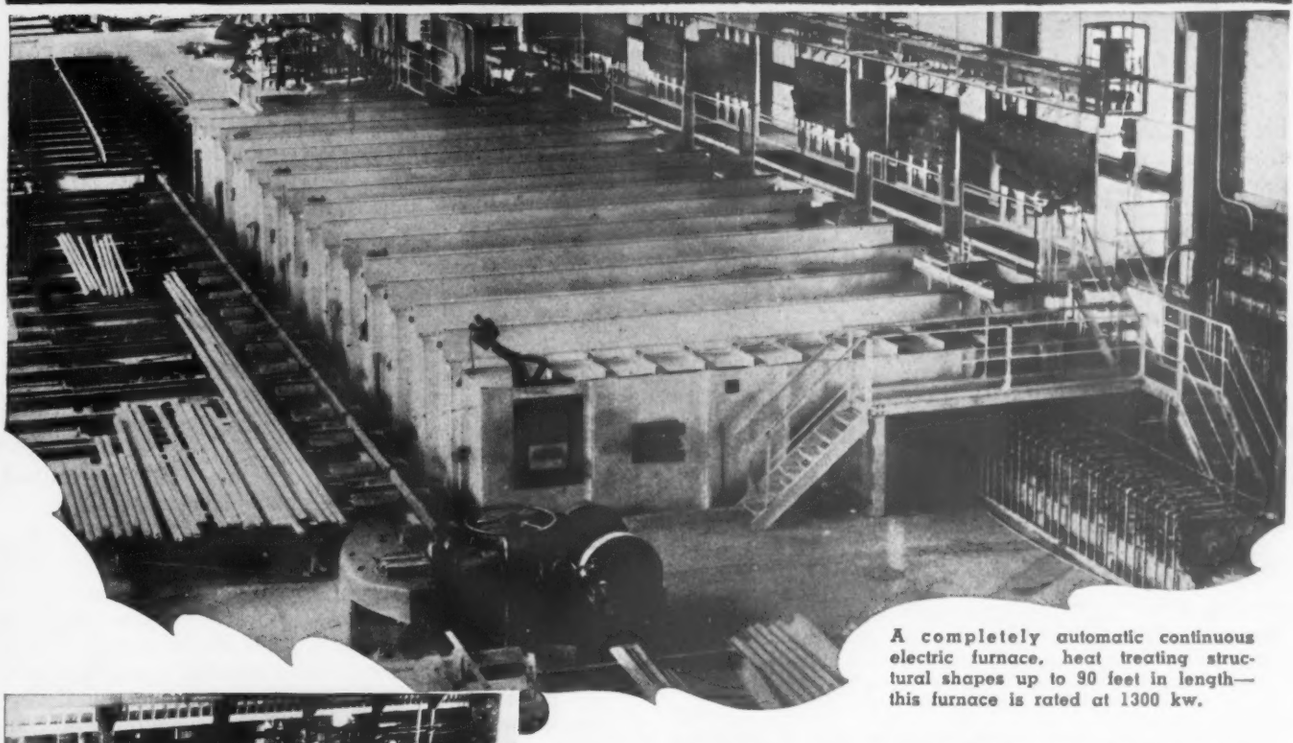
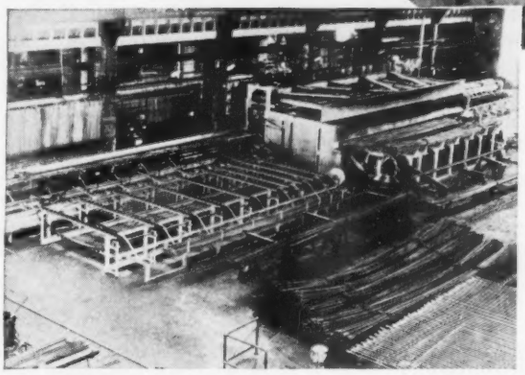


A completely automatic continuous electric furnace, heat treating structural shapes up to 90 feet in length—this furnace is rated at 1300 kw.



A gas fired heat treating furnace, quenching machine and rod straightener—handles sucker rods up to 30 ft. long.

NO JOB IS TOO LARGE OR TOO UNUSUAL!

The Electric Furnace Co., because of its great number of successful, large and unusual furnace installations, has justly earned an enviable reputation for solving difficult production furnace problems.

The two furnaces shown on this page are typical examples—the large aluminum furnace shown above is completely automatic—large structural shapes up to 90 ft. in length are automatically charged into the furnace, carried across the heating chamber and discharged through a spray quench—everything automatic.

The heating chamber is 93 ft. in length by 26 ft. in width and despite its unusual size this furnace maintains a uniform temperature throughout the entire heating chamber. To our knowledge this is the largest furnace of this type ever built for this purpose.

The furnace shown at left is another outstanding installation—this equipment heats, quenches and straightens rods up to 30 ft. in length and was the first successful continuous furnace of this type built for this process. Several somewhat similar installations have since been made.

If you have a difficult production furnace problem put it up to our experienced engineers—No job is too large or too unusual.

ELECTRIC FURNACES FUEL FIRED

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The Electric Furnace Co., Salem, Ohio

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has raised the problem of successful heat treatment in a gas atmosphere, because products of combustion containing carbon dioxide and water vapor tend to oxidize the molybdenum, thereby rendering it volatile so that it distills from the surface of the steel which is also decarburized by such a treatment. It has been found, Mr. Cowan reports, that charcoal gas essentially free from carbon dioxide and water vapor and with a low hydrogen content is satisfactory. A number of furnaces designed with an integral charcoal generator are able to heat treat without loss of molybdenum or carbon and without formation of scale in surroundings wholly gaseous.

Cheaper Atmospheres Important

Simplifying and making cheaper atmospheres available for those applications in which quality heat treatment is necessary constitutes important progress, according to C. E. Peck, heating section engineer, DC generator engineering, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. An inexpensive atmosphere, consisting of 99.5 per cent nitrogen with 0.5 per cent carbon monoxide and hydrogen, for heat treating silicon steels is produced from complete combustion of hydrocarbon gas from which carbon dioxide and water vapor are removed. The equipment is essentially a nitrogen generator and is capable of producing practically pure nitrogen, or it can be made to produce nitrogen, hydrogen carbon monoxide mixtures suitable for bright annealing and heat treating various high carbon and alloy steels without oxidation or decarburization.

For high carbon alloy steels and tool steels, Mr. Peck continues, the cracked hydrocarbon gas containing high hydrogen and carbon monoxide is useful, particularly when decarburization must be eliminated. This gas is produced from an equipment in which cracking process must be promoted by applying heat externally to the gas. The gas is rich enough in combustible constituents that it will not maintain combustion within itself and is less expensive than the so-called nitrogen type because it is not necessary to remove carbon dioxide or water vapor to obtain desired results, particularly for a short-cycle heat treating and hardening operation.

Increase during the past year in the number of deep case gas carburizing furnaces, both of the continuous and stationary type, impresses T. A. Frischman, chief metallurgist, Axle division, Eaton Mfg. Co., Cleveland. Gaining favor also for speed, economy and better shop conditions are the shallow case depth gas carburizing or dry cyaniding furnaces which are especially adaptable to transmission gear work. More and more, he states, are liquid carburizing baths being used to produce the deeper cases.

Mr. Frischman concludes by saying that the past year also has seen introduction of small converters for induction hardening of a variety of products. This process offers great possibilities for differential annealing by replacing copper plating and lead drawing as a means of producing intentional soft surfaces on hardened products.

Substantiation of the importance of progress in controlled atmosphere heat treating of tools steels is given by A. M. Steever, superintendent, Columbia Tool Steel Co., Chicago Heights, Ill. He says certain atmospheres produced from a carbonaceous material such as charcoal which has a high order of reaction, and an oxidizing base gas such as air, in self-contained generators integral with the furnace produces a mixture of balanced carbon oxides largely diluted with inert nitrogen, hence a controlled atmosphere nonoxidizing and nondecarburizing.

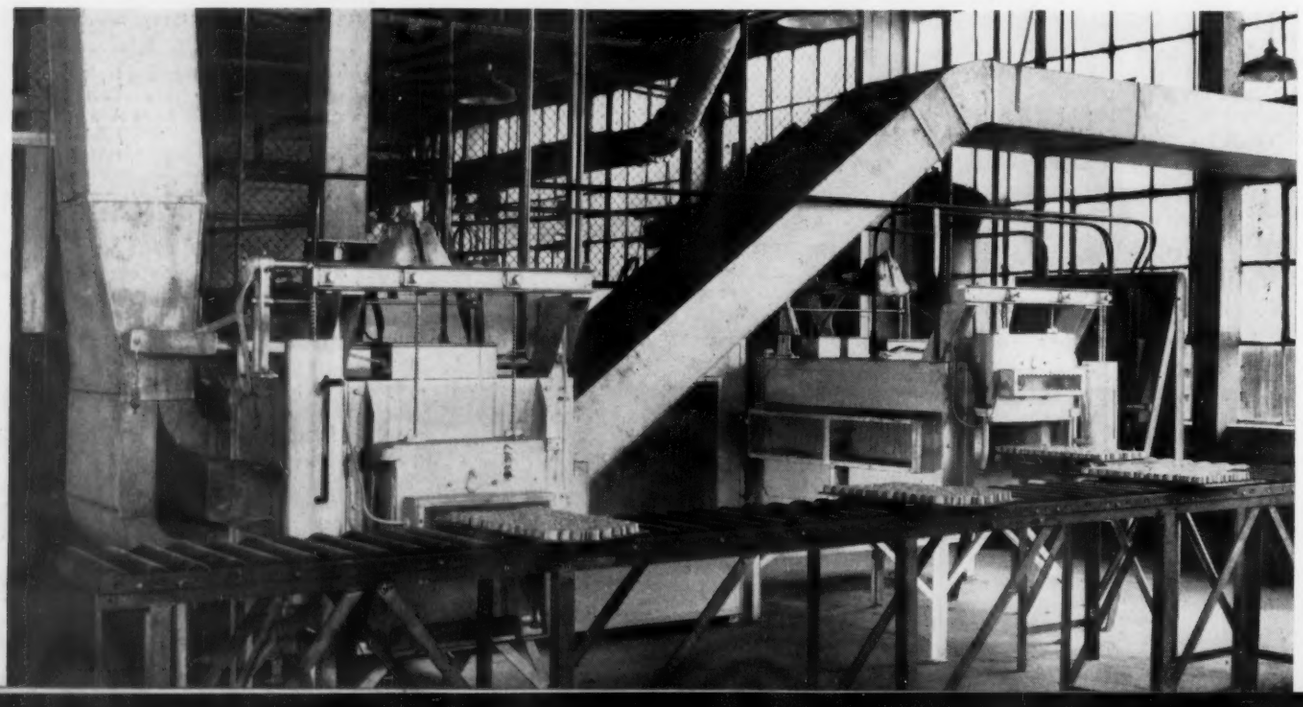
Low-Cost Nitrogen Available

Availability of recently developed generators for production of low-cost pure nitrogen also provides an added source of atmospheres for all types of heat treatment, he declares. This general trend, he feels, has been of outstanding importance because it represents first a requirement for new equipment that is capable of producing controlled results, and second, the need for manipulation experience in use of temperature and atmosphere control resulting with a definite improvement of product.

Increasing demand for improved surface conditions on rod, wire, tubing, sheet and miscellaneously heat treated parts in ferrous and nonferrous alloys

(*Please turn to Page* 298)

■ **As heat treatments become more complex, furnace manufacturers design units to meet the new demands. These furnaces, in the plant of Continental Motors Corp., Detroit, perform a complicated treatment on special alloy magnets**



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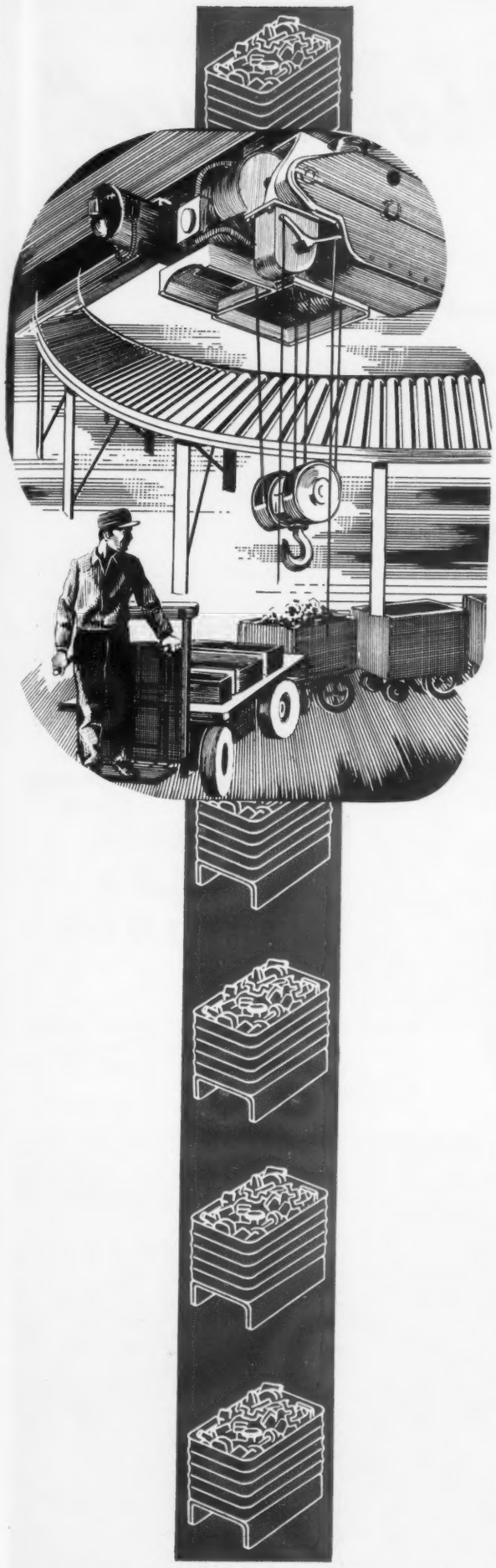


MATERIALS HANDLING

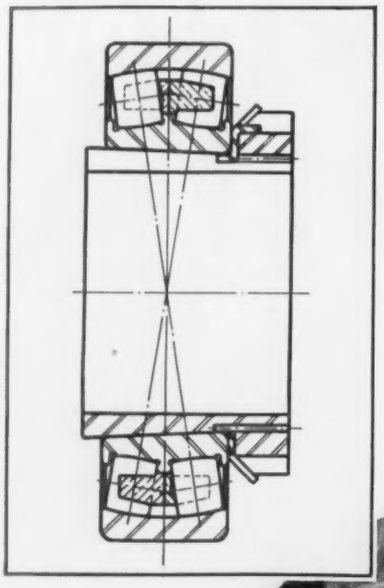
■ OUTSTANDING development in materials handling equipment during the past year perhaps is the combining of conveying and processing equipment. Several such installations have produced significant results and the year 1939 may see a growing trend in this direction. Other developments of 1938 include faster cranes and hoists, wider range of power truck sizes and services, unit packaging of products to reduce shipping and handling costs, steel band strapping of heavy shipments, notably structural shapes, and numerous other improvements.

More important possibly than technical developments are the important effects exerted by governmental regulation in 1938. These strongly emphasize the necessity of using adequate materials handling equipment, as W. White, secretary and general manager, Euclid Crane & Hoist Co., Euclid, O., points out. He says, "Present conditions take more and more cost factors, such as wage rates, hours of work, taxes, etc., out of the hands of management and put them into the class of uncontrollable expense items. This means that more and closer attention must be given to remaining factors affecting controllable costs. In most plants, one of the principal items is the cost of handling material in process and finished goods. No plant manager can afford to overlook the savings possible by installing modern materials handling equipment.

Predicting an even greater tendency toward mechanized handling, E. J. Heimer, vice president, Barrett-Cravens Co., Chicago, says, "The year 1939 will be a promising one in the materials handling field. To substantiate this do not overlook the fact that the Wage and Hour bill has completely reversed the labor situation in the South. Manufacturers there are already considering installation of modern materials handling equipment as it is most essential to keep their costs down to a point where they can operate successfully.

"In addition," Mr. Heimer continues, "employers are realizing the advantages in building goodwill among their employes by giving them the help of the best possible handling equipment. Hence, a lot of antiquated materials handling equipment will be replaced within the next 12 months by more modern, practical and safe equipment. Such a

Tables "go to town"



Good tables need bearings that have:

1. Rolling alignment to compensate for warpage, deflection, and misalignment.
2. High capacity always 100% available.
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4. Compactness, simple design—a self-contained unit.

Only the SKF Spherical Roller Bearing has these advantages. When you specify SKF, you can be assured the right bearing is in the right place. SKF Industries, Inc., Front St. & Erie Ave., Philadelphia, Pa. 4247

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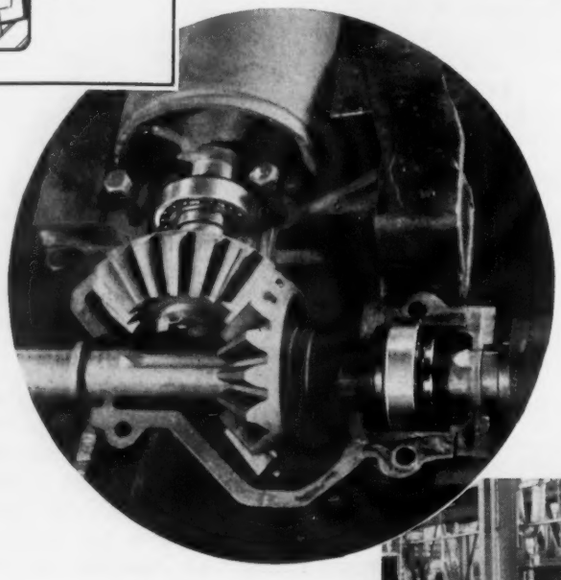
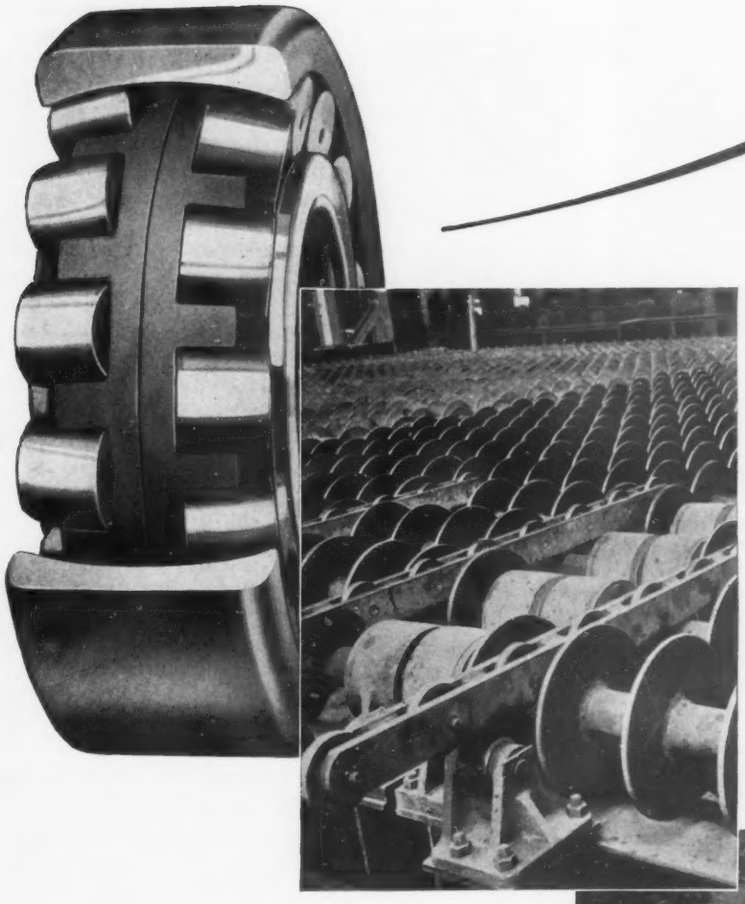
ROLLER BEARINGS



● More than 200 SKF Spherical Roller Bearings completely support the lineshaft. They are also used for taking radial and thrust loads on the table rollers.

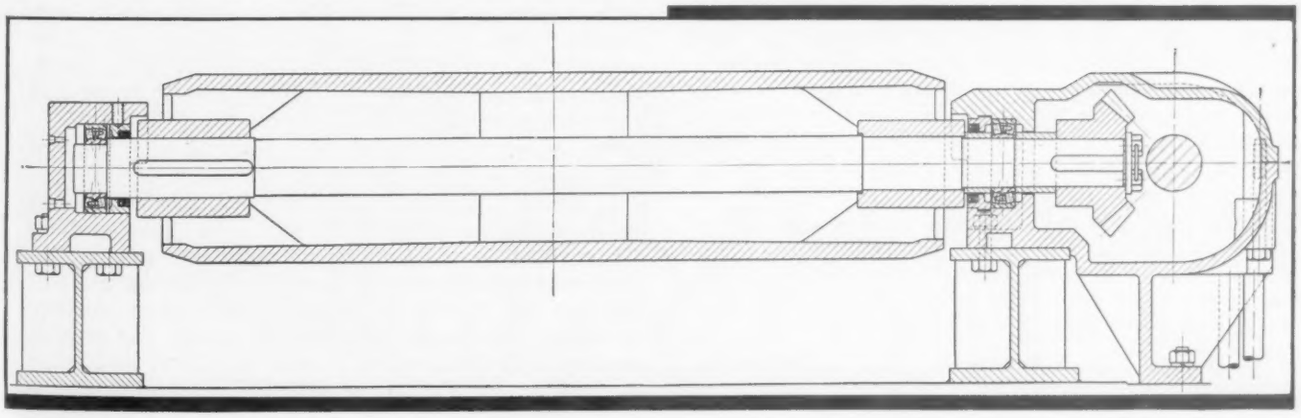
● An SKF Cylindrical Roller Bearing and an SKF Spherical Roller Bearing are inside each of these Motor Roller Scale Tables. A second SKF Spherical Roller Bearing in an SKF Pillow Block is mounted at the live shaft outboard location.

on SKF Bearings



● 344 Spherical Roller Bearings work together on these Cooling Bed Tables in a 100" Plate Mill. The entire unit can be turned by hand by twisting at the coupling.

● 44" Blooming Mill Billet and Slab Transfer Tables. 100% SKF-equipped. SKF Spherical Roller Bearings are in the gear reduction unit as well as completely supporting the lineshaft and table rollers.



■ **Cranes, hoists and monorails are important equipment in all lifting operations. This illustration shows a hoist mounting a skelp reel in the new butt-weld pipe mill of Spang, Chalfant & Co. Inc., Etna, Pa.**

step obviously enhances industrial relations through elimination of hazards and relieving the worker of fatigue, thus making his job easier. At the same time, it gives a definite beneficial effect with reference to lower production costs, so essential for continued operation."

Somewhat similar factors are seen by H. M. Miller, president, American MonoRail Co., Cleveland, as reason for optimism in 1939. He says, "Mechanized handling will become increasingly popular during the coming year for the simple reason that it offers the most effective solution to management's two most troublesome problems—low cost production and profitable use of manpower. Mechanical methods of moving goods not only reduce handling costs but also release skilled labor for profitable production. Such systems thereby increase the total output per man-hour at the same time they create an equitable distribution of labor costs."

J. R. Harlan, Yale & Towne Mfg. Co., Philadelphia, points out, "With recovery in American industries and acceleration of production in 1939, materials handling equipment will have an even greater influence toward cutting production costs than at any time in the past. Even with less than 75 per cent of the nation's capacity engaged in production, materials handling machinery will be one of the most important purchase considerations because 'while handling adds to the cost of a product, it adds nothing to its value.'

"There is," Mr. Harlan continues, "'a growing tendency among leading industries toward the use of heavier and higher grade handling equipment, hence new developments in electric industrial trucks as well as in hand lift trucks and hoisting equipment have been numerous and varied. New controllers for electric trucks, new air-cooled design for hoists, and hand lift trucks with capacities up to 10 tons are typical developments.

"There also has been a decided trend toward use of double-faced pallets. These, combined with hand lift trucks and power fork trucks, afford a highly efficient system for handling and stacking loads and has avoided necessity of building additional storage capacity in several instances. . . . There seems to be no end to the demand for hand lift trucks to handle odd shaped loads such as cable reels, tanks, carboys, etc. . . . Scale lift trucks for use in industrial plants also have met a rapidly increasing demand during the past year," according to Mr. Harlan.

Much Special Equipment Developed

"In the tramrail type of overhead materials handling equipment, the trend is more and more to the development of new devices or adaption of standard units to fit the special needs of the individual user with the object of incorporating the materials handling equipment with processing equipment," says John Booher, Cleveland Crane & Engineering Co., Wickliffe, O. He continues, "A decided trend then in making it a part of the production equipment is to make it more and more automatic, in some cases the tramrail units or system becoming almost a robot.

"In industries employing overhead traveling cranes, many units are found in operation after 30 or 35 years of service. These, as might be expected, are slow both in travel and hoist and not suitable for modern production methods," Mr. Booher points out. "Possibly the most noticeable development in hoists and cranes is the requirement of faster handling speeds. Modern cranes have speeds as much as 50 per cent faster than older designs and so not only speed up actual handling but also save much time of workmen waiting their turn for crane service.

"Improvements in braking and control now permit safe, accurate handling of loads at relatively high speeds. One modern crane may replace two older ones by reason of its higher speed. Speed, speed, decreased man-minutes per given task, is more and more the present day cry," concludes Mr. Booher.

An example of the savings possible with modern equipment is given by H. S. Germond, Revolvator Co., North Bergen, N. J., who says, "One firm has been paying an $80,000 bill each year for handling its product in and out of storage. A nominal investment in modern materials handling equipment will cut this cost in half and prepare the way for further savings." He predicts, "This mad search for greater savings will develop many new variations and some radically new design in materials handling meth-

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ods and equipment outstanding in service values."

F. E. Moore, president, Mathews Conveyer Co., Ellwood City, Pa., believes materials handling progress is similar to that of the automobile, which while first regarded as impractical and visionary now has become essential to American life. He says, "The materials handling industry has grown through the years and, as in the case of the automobile, handling equipment is no longer a luxury, rather it is a necessity. There is hardly a company in the United States today that can succeed on a competitive basis without the use of adequate materials handling devices."

Definite trends in the industry are noted by a number of authorities. C. B. Cook, Elwell-Parker Electric Co., Cleveland, says, "More care is being given to the selection of power trucks as regards actual conditions of use. . . . Higher stacking of unit loads has prevailed and an increasing percentage of telescoping upright fitted trucks, rather than nontelescoping types, are being ordered. It is interesting to note the continued interest and employment of truck handled special pallets, skids and containers in moving material between plants over rail and highway, saving labor formerly wasted in rehandling and which added much to cost but nothing to value."

D. L. Darnell, sales manager, Baker-Raulang Co., Cleveland, comments, "It is our opinion that the trend towards the fork, or 'finger,' lift types of trucks will continue and perhaps gain momentum during the coming year. Plant operating men are beginning to realize that this type of truck with its auxiliary equipment offers the best possibilities for profits due to low cost of pallets compared with the skids necessary for platform trucks and also because these pallets are smaller in size compared with skids, consequently taking less storage space.

"Size of unit loads probably will not increase as they at present are about as large as size of doors, aisles, etc., permit. Speeds also are as high as safety will allow, in most cases. During the past year, there has been a tendency to purchase gasoline-powered trucks due to their low original cost. With better times ahead, it is thought this feature will have less importance and that the lower overall operating cost of the storage battery truck will become the predominant factor," Mr. Darnell adds.

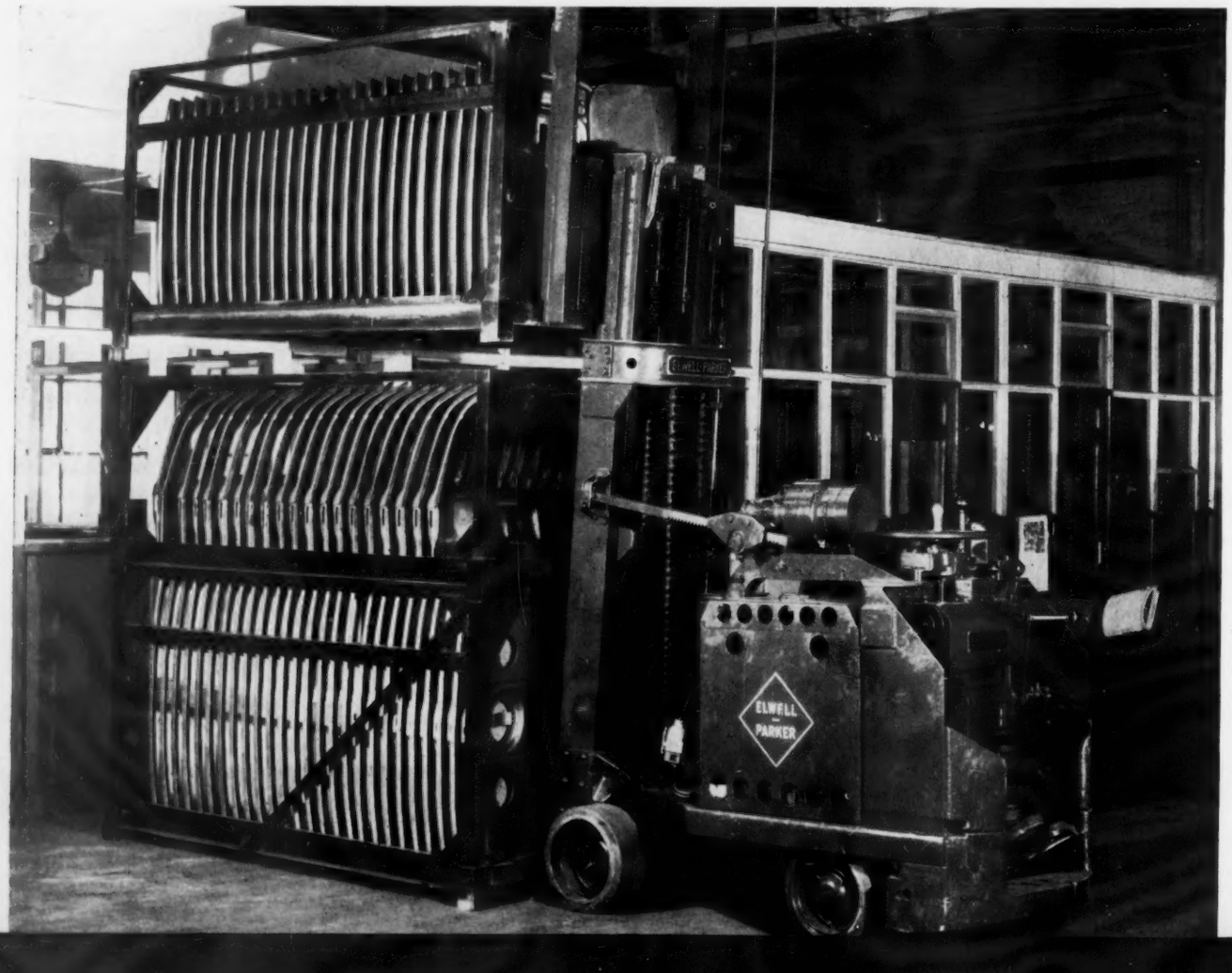
C. D. Eiler, secretary, Crescent Truck Co., Lebanon, Pa., points to the large part electric industrial trucks and tractors have played in materials handling progress the past 12 months. He states, "These compact mobile units, from the giants of 50,000 pounds capacity to the 2000-pound midgets, have met successfully every demand of modern materials handling."

Trend in steel mills is toward continuous handling of strip and sheets, according to W. H. Logan Jr., Logan Co., Louisville, Ky., who says, "One of the latest developments, combining conveyors and steel processing machines, is that in which either coiled strip or sheets are started through the line at one end and come out the other end in finished sheets, cut to length, squared and roller leveled.

"Another recent development," he continues, "is the passing of long sheets through a similar continuous process in which two or more sheets are

(*Please turn to Page* 308)

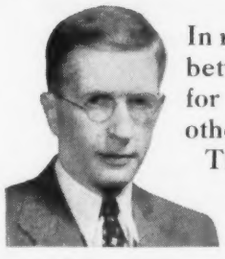
■ **Ingenuity solves many bothersome materials handling problems. Here automobile body panels stacked in nesting-type steel containers are shown being handled with facility by a tiering truck**



HOW TO HANDLE IT

Production costs zoom when men and machines are forced to stop in the middle of a run.

IF IT IS KEEPING STEEL ON THE MOVE



In rolling mill or strip mill, unfailing conveyor service between costly production units is vitally important, for shutdowns for repairs on conveyors can ruin an otherwise good production cost sheet.

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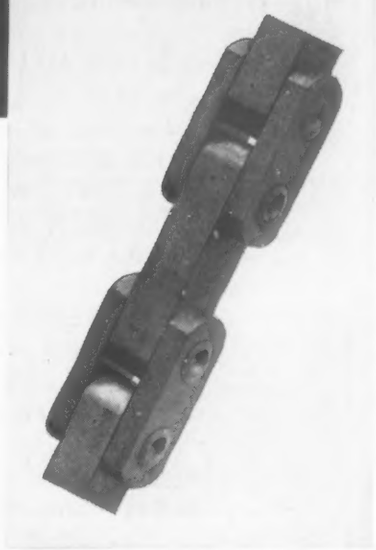

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JOINING AND WELDING

■ THE PAST YEAR has been notable for improvements in all types of fastening and joining systems with cold riveting coming into prominence in the riveting field. Much progress also was made in brazing and use of special types of fasteners. New welding processes, improvements in equipment, procedures and results obtained, as well as increased general acceptance of welding, mark the year, 1938. The Unionmelt, smothered arc, process found commercial application in a variety of industries and so definitely becomes one of the important production methods. In resistance welding, the Hart process and the Ultra-Speed welder constitute significant improvements.

Referring to welding advances, A. F. Davis, vice president, Lincoln Electric Co., Cleveland, says, "As result of adoption in new fields and increased use by welding-user industries, welding made marked progress in 1938. As acceptance of arc welding increases, greater attention is being paid to efficiency factors. Thus we find users stressing the importance of proper technique and procedures; paying more attention to preparation, handling and positioning of work for welding."

"Increased emphasis on welding efficiency has led to use of larger size electrodes to reduce welding costs," states Mr. Davis. "Advantage is also being taken of electrodes developed especially for fast production of particular types of welds such as fillets and butts. Improvements and refinements in arc welding machines and controls also aid increased efficiency. New compounds permit easy removal of 'spatter', one reducing cleaning time after welding by 20 to 60 per cent.

"Although arc welding has made remarkable progress, it is nowhere near its limits. For every application where the process is used today, there are four others, economically justified, where it is not employed. This means the advantages of arc welded construction are being obtained in only 20 per cent of the possible applications," concludes Mr. Davis.

P. G. Lang Jr., engineer of bridges, Baltimore & Ohio railroad, Baltimore, points out that many of the difficulties thus far encountered in welding have been due to the rapidity with which it has permeated the industrial

■ **Advanced technique, more efficient equipment, improved materials and new codes will promote the use of welding processes during the coming year. Photo courtesy General Electric Co.**

field, far outstripping the orderly process of co-ordination and standardization. "The current need and trend in welding is toward limiting the number of specifications, codes, etc., and imparting to those actually in use the utmost thoroughness and uniformity. In no field is standardization more essential," Mr. Lang adds. "Economy and efficiency, demand continued efforts in this direction."

According to R. F. Wyer, industrial department, General Electric Co., Schenectady, N. Y., one of the outstanding developments of the year in welding is the extension of procedure control in arc welding. He points out, "Separating the qualification of the process from qualification of the operator already has been of assistance to users of welding. Where a process of welding has been thoroughly investigated and qualified, the qualification of an operator is simplified to the point where it is only necessary for him to show that he is capable of making good welds. This is as much a part of procedure control as setting up of standards for welding speed, current, arc voltage and class of electrode. Its importance is becoming more and more realized."

Mr. Wyer also adds, "Fortunately, the trend toward accurate procedure control is spreading rapidly, and is being fostered by various agencies interested in assuring that maximum benefits of arc welding are not lost in shops that may not be sufficiently well organized and controlled to take advantage of them."

C. H. Jennings, research department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., directs attention to increased importance of automatic welding due to its ability to produce high quality welds at low cost and great speed. He says, "The inherent limitations of automatic welding for certain classes of work are being overcome by semi-automatic equipment. . . Welding manipulators and fixtures are increasing in popularity because they increase welding speeds, improve weld quality and facilitate working in the easiest position with the largest and fastest electrodes without retarding production for excessive set-up time. . . An important adjunct to welding is the development of special suction fans to remove fumes from welding thus improving atmosphere when welding in closed or confined spaces, and making possible better visibility during welding."

Tests To Be Simplified

"Testing welding procedures and operators," as E. R. Fish, chief engineer, Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn., points out, "and demonstrating these points to the satisfaction of inspecting and insuring companies has been a source of exasperating expense to many manufacturers. As a help in this situation," Mr. Fish says, "a committee of the American Welding society will probably, in the near future, suggest some modified tests to simplify qualification of operators without sacrificing the certainty of the demonstrations."

Welding of steel structures received a notable impetus this year due to revision of a number of building codes to permit its more extensive use, according to R. B. Lincoln, director, National Weld Testing Bureau, Pittsburgh. "Testing of electrodes, qualification of processes and operators are fairly well worked out and now present few problems," says Mr. Lincoln. He adds, "Many engineers with little previous experience on welding now are being called upon to design welded structures. It is hardly to be expected that every designer will become a welding expert. Thus there is a distinct need for an authoritative and universally accepted standard handbook showing typical welded joints."

"This need," points out Dr. Gilbert E. Doan, professor, Lehigh university, Bethlehem, Pa., "appears to be answered in the *Welding Handbook* just issued by American Welding society, New York, a book that will certainly unify and improve practices. . . In the field of testing," Dr. Doan continues, "some recent refinements of the X-ray and gamma ray theory have made possible a shortening of the exposure times needed for dependable registry of flaws. Examination of thick section with short distances from radium to film is now possible."

Reviewing 1938, Robert E. Kinkead, consulting engineer, Cleveland, says, "The real progress in welding in 1938 will not appear in commercial use until 1939. Among the things with which I am personally familiar and which belong in this class is an automatic machine that welds coils of strip together to get longer coils. This equipment accurately trims coil ends, flash welds the ends together, trims off

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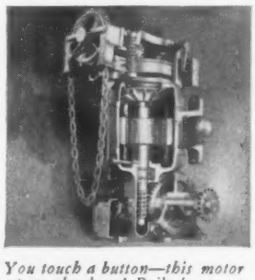

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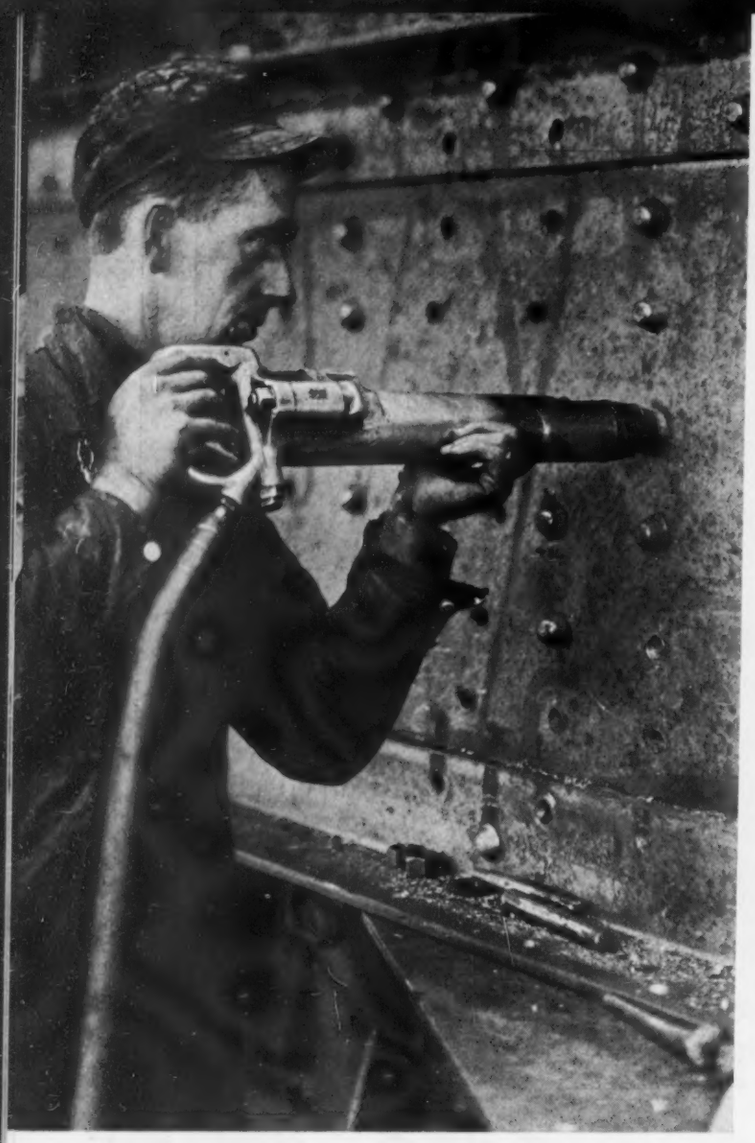

■ Machinery and structures involving tremendous tonnages of steel are constructed by hot and cold riveting. This workman is using a pneumatic hammer to drive rivets in the frame of a large shovel. Photo courtesy Ingersoll-Rand Co.

the flash and side clips ends of the welds. First installation will be at Ford's River Rouge plant.

"Another development," says Mr. Kinkead, "is the manufacture of stainless clad composite metals by carbon arc welding. This has been carried out on an experimental basis with reduction to commercial practice probable in the next year."

An outstanding feature of the year's progress is increased use of welding in aircraft work. Carl de Ganahl, president, Fleetwings Inc., Bristol, Pa., reports his company is operating some amphibian airplanes built completely of shot-welded stainless steel. Seven stressed-skin stainless steel wings, also entirely shot welded, are in service by the Air Corps which has, in addition, 100 or more sets of tail surfaces and ailerons of fabric-covered stainless steel, all built by this company. Welded stainless steel is gradually being recognized by the aircraft industry as a serviceable product with considerable merit, according to Mr. de Ganahl.

In speaking of aircraft welding, J. B. Johnson, chief, Material branch, Air Corps, Dayton, O., says, "The aeronautical industry is primarily interested in welding because it offers a means of reducing costs and increasing production. Use of spot welded assemblies fabricated from aluminum alloys is increasing although somewhat restricted by the non-availability of satisfactory portable welders. Spot welding of 18-8 stainless steel is not handicapped in this respect since the power required is much lower and therefore portable welders now available produce satisfactory results.

"Recent developments in arc welding machines and coated electrodes have increased the number of applications in which arc welding can be used to advantage in airplane construction. Speed of arc welding has always exceeded that of gas welding in aircraft construction but not until recently has the technique been developed so equal penetration and smoothness of bead could be obtained on thin sections. There is every indication that use of arc welding in this work will increase substantially," concludes Mr. Johnson.

Also commenting on welding of aircraft, C. L. Hibert, Consolidated Aircraft Corp., San Diego, Cal., points out, "Present advent of larger and still larger ships may greatly enlarge the use of stainless steel with its desirable corrosion resistance, high strength and ease of assembly by spotwelding.

Use of Stainless Steel Increases

"In resistance welding, stainless steel has many advantages over aluminum alloys as the aircraft industry is permitted to weld but few of the aluminum alloys and these may be used only for secondary structures. In addition, these alloys require high current values and are difficult to weld. On the other hand, stainless may be used for primary structures and is easily welded. Cost per weld is much less and weld is strong in tension, shear or torsion. Against this, stainless has certain disadvantages in design because of the thinner gages necessary. Also cold rolled stainless, which must be used for an equivalent weight-strength ratio, is difficult to form.

"A suitable steel for production resistance welding of aircraft would be of high strength, corrosion resistant, less than 0.20 per cent carbon, and heat treatable for ease in forming in the annealed state," according to Mr. Hibert. "Resistance welding," he adds, "would greatly cheapen the cost of aircraft and only awaits the development of a suitable steel for general adoption."

This view parallels that of J. W. Meadowcroft, assistant works manager, Edward G. Budd Mfg. Co., Philadelphia, who predicts general adoption of welded stainless steel construction for airplanes and says, "The next three years will see more advance in the art of resistance welding than has been accomplished during the past 20 years. More research work has been done in connection with welding in 1938 than in previous years and 1939 finds us with a program that surpasses even this."

S. M. Humphrey, chief electrical engineer, Taylor-Winfield Corp., Warren, O., also believes advances of 1938 indicate a greatly widened field for resistance welding. He points out, "Recognition that resistance welders are machine tools and so deserve the same precision in design and manufacture as the best of automatic machine tools has definitely resulted in a marked improvement in quality and precision of equipment now being sold. Attention given production capabilities of such equipment has

(*Please turn to Page* 310)

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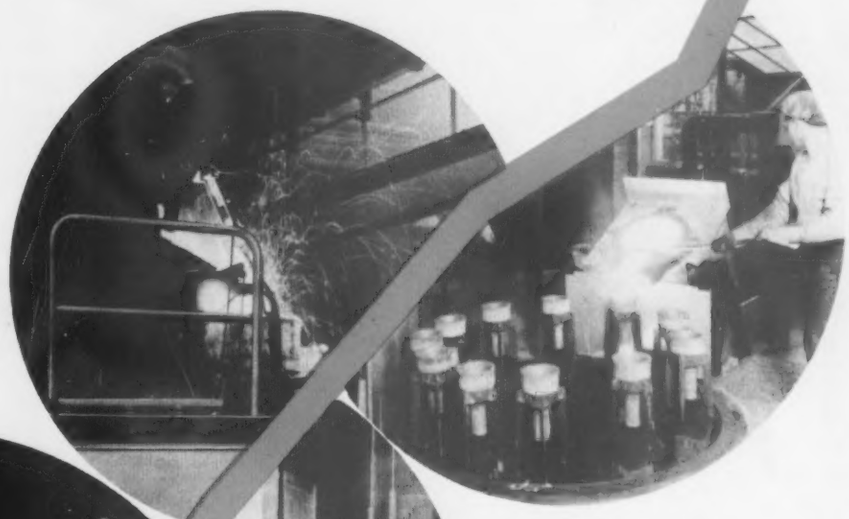
The curve on this page shows the growth in KW of Ajax-Northrup Furnaces installed all over the world during the past ten years.



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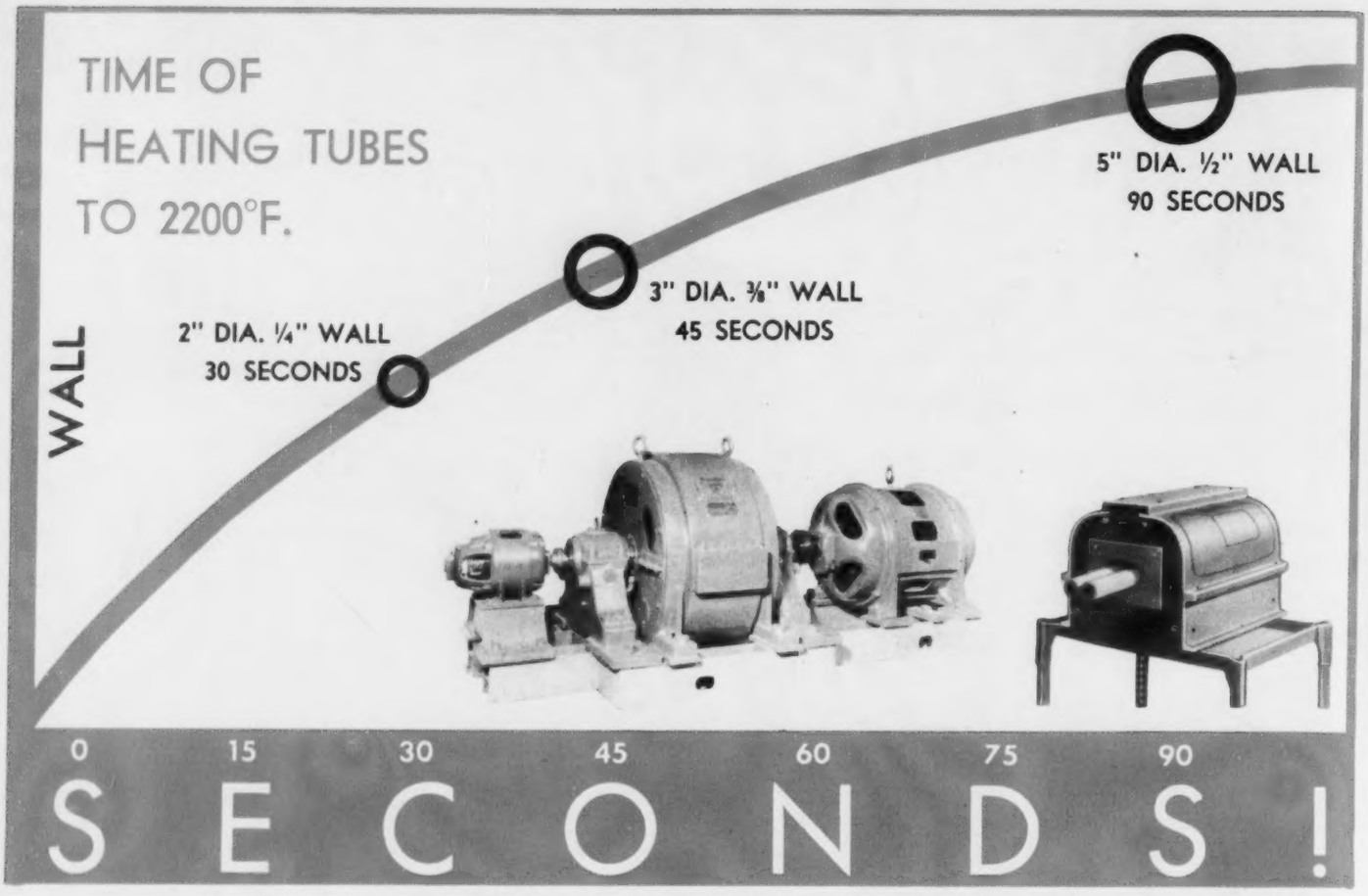

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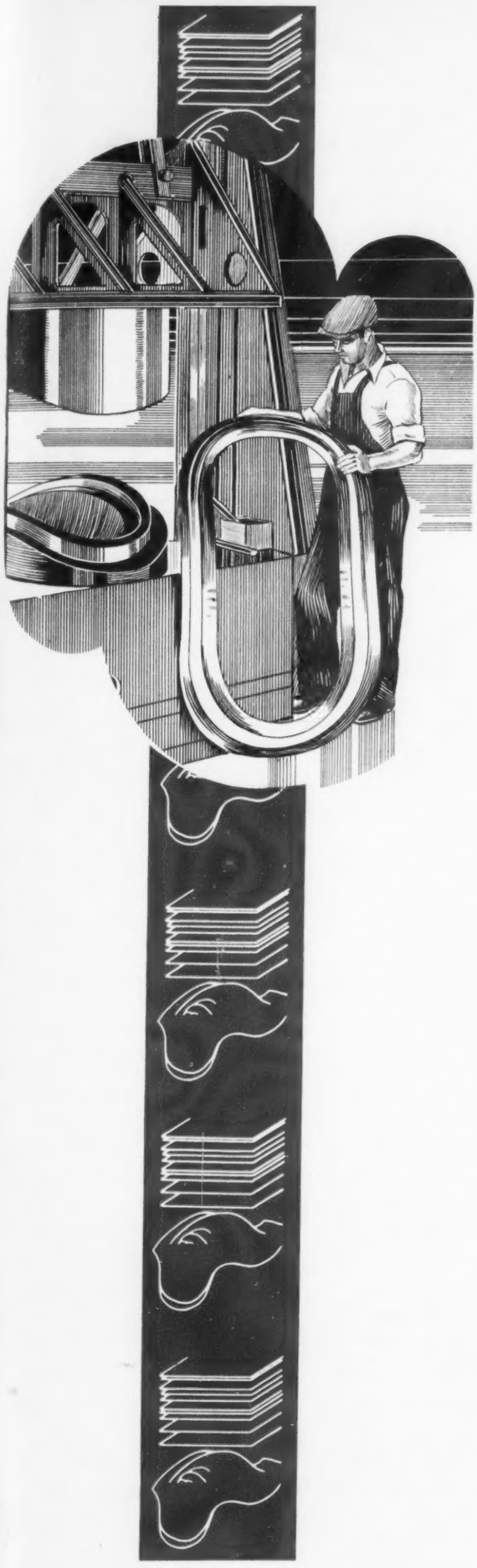


STAMPING

■ PERSISTENT efforts of metal fabricators to increase speed of quantity production and at the same time to lower costs have led to significant developments during the past year in the quality of drawing steel and in the design of stamping and forming equipment. Benefits of this progress will be reaped this year.

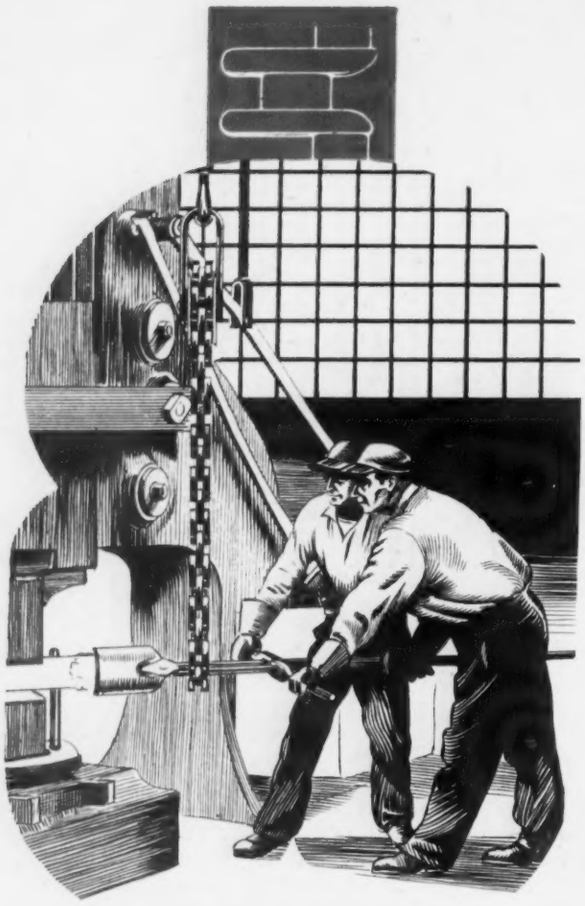
Fender and body stampings for 1939 automobiles have created the most difficult problems ever encountered by sheet mills and press shops, writes E. L. Wetstein, vice president, Great Lakes Steel Corp., Detroit, in looking at the pressed metal industry from the steelmaker's viewpoint.

Extent to which automobile streamlining has been carried gives little evidence that designing engineers have recognized the limits of drawing quality imposed by the present state of metallurgical knowledge in production of a super drawing quality steel sheet, comments F. B. Poto, mill representative, Inland Steel Co., Chicago. While in some cases this has resulted in loss of production and increased cost to the fabricator of difficult stampings, and to heavy "charge backs" to the steelmaker, it has forced producers of steel to intensify their efforts to supply an entirely satisfactory product.

To meet these conditions, it was the tendency during 1938 to "tailor make" steel to suit the customer's particular requirements. In producing a more suitable sheet from continuous mills, more accurate metallurgical control of hot mill finishing temperature and rate of cooling has been emphasized. In cold reduced sheet from continuous mills greater refinements in annealing practice and rates of cooling from the anneal were developed. Effects of surface condition and grain structure on drawing quality were studied further. Steelmakers now are trying to achieve a better balance in softness, ductility and tenacity of sheets for severe drawing requirements, Mr. Poto states.

While non-aging sheets had been used to some extent previous to 1938, intensive efforts have been made with some success to develop the processing for producing a softer, more ductile steel in this grade. Although such

(*Please turn to Page* 319)



FORGING

■ THE NEW YEAR starts with bright prospects for the forging industry, judging by progress made in 1938. Applications for drop forgings are on the increase as production of more intricate and special types has been made possible through improved hammer and press practice and through ability to produce suitable dies. Accuracy of dimensions which minimizes machining is a feature of today's forgings.

A growing realization of the importance of "engineered forgings" impresses Waldemar Naujoks, chief engineer, Steel Improvement & Forge Co., Cleveland, as a most important 1938 trend in the die forging industry. This term implies a rapidly growing change from use of simple or low-priced forgings to tailored products designed to offer maximum serviceability and economy for specific requirements.

Every factor affecting its use is considered in the engineered forging. Static and dynamic strength, hardness, weight, appearance, temperature conditions, corrosion, machinability, tolerances, subsequent processing and assembling, and the like, which have a bearing on the balance between utility and economy, are weighed to obtain maximum benefits, Mr. Naujoks emphasizes.

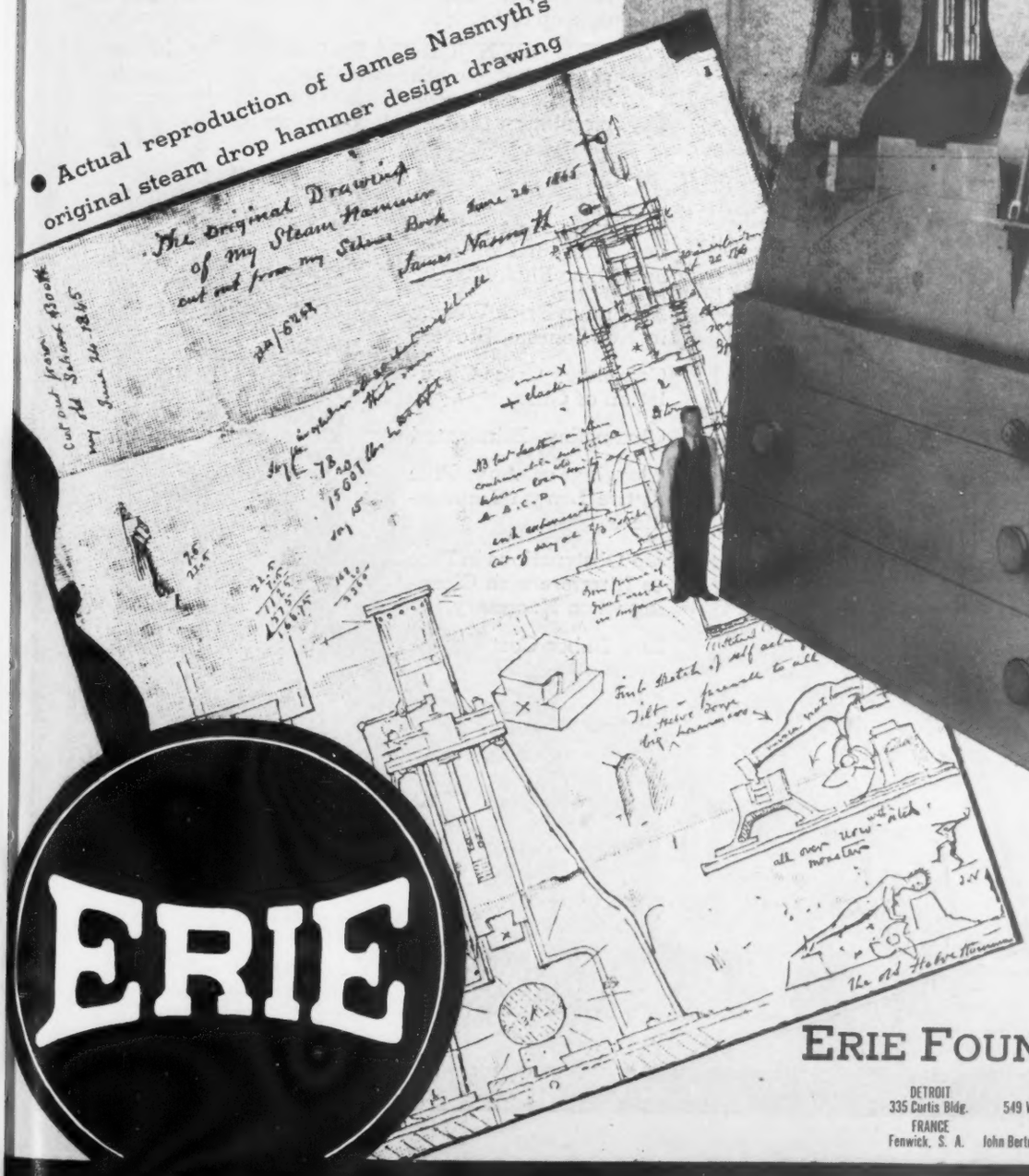
A specific example of this trend is increased demand for forgings completely heat treated, machined and ready for assembly; this permits the forging engineer to use his ingenuity to develop the most desirable processing cycle in converting raw stock to finished part. The new condition, he states, is a real departure from the days when interest in the forging did not extend beyond removing the scale. Development of engineered forgings incorporates necessary and desirable features with greater economy and permits the die forging industry to keep apace with general progress in the metals field, Mr. Naujoks concludes.

Ability of drop forgers to design dies and tools to fabricate forging shapes of the most intricate type commercially has developed many new items for forging manufacture during the past year, says R. W. Thompson, sales engineer, Transue & Williams Steel Forging Corp.,

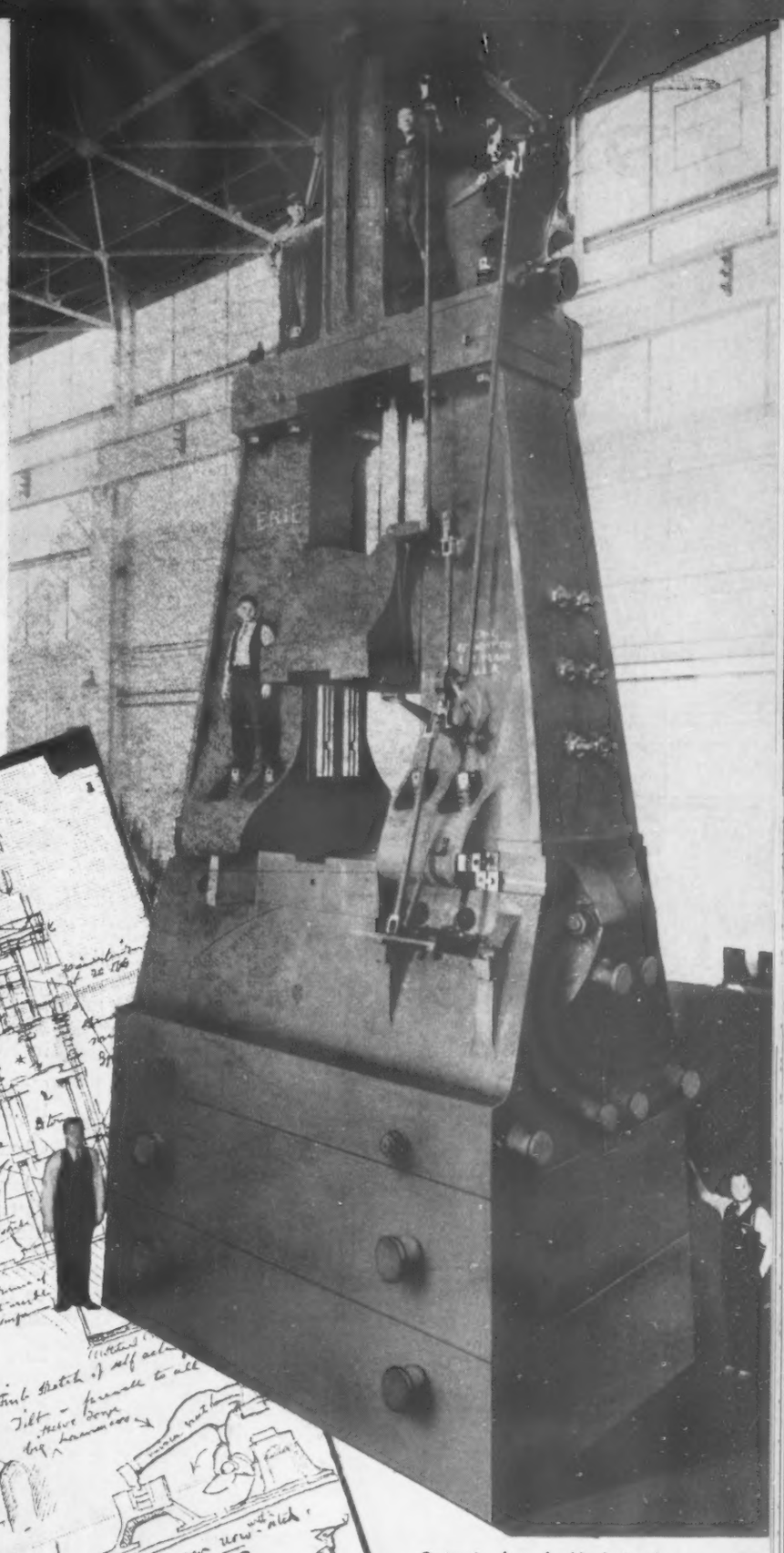
(*Please turn to Page* 317)

In 100 *Years . . .*

FROM the Great Grandfather of all steam drop hammers designed in 1839 by James Nasmyth in England, to this great Erie, the largest steam drop hammer ever built, is a long jump . . . For 35 years of the century since 1839, Erie Engineers and Craftsmen have constantly improved steam drop hammer design and construction . . . The result . . . this gigantic Erie for aircraft forgings, to be used, strangely enough, in England . . . The Great Grandson of Nasmyth's "Scheme Book" portrait returns home to carry on the traditions of the Art of Forging.



● Actual reproduction of James Nasmyth's original steam drop hammer design drawing



ERIE

Write for full details on the construction of this Erie Steam Drop Hammer . . . Bulletin 325 gives you the story.

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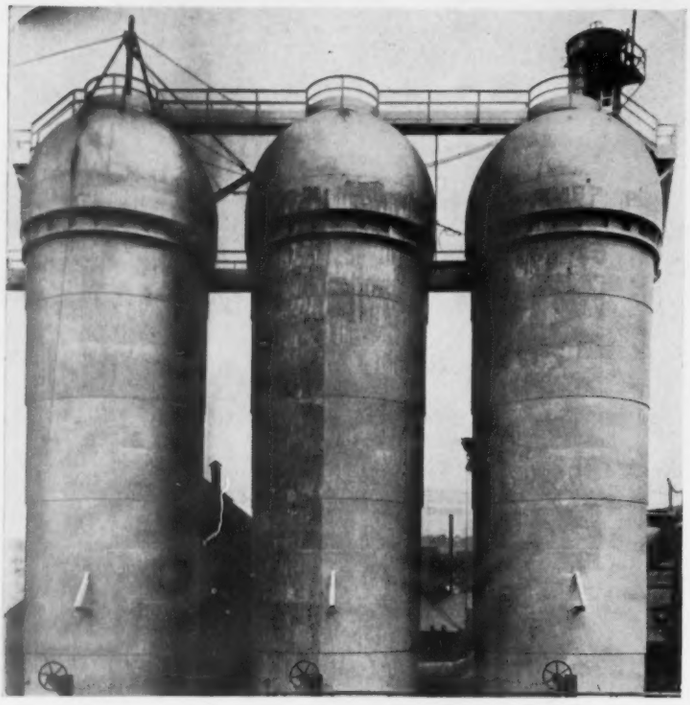
PROFITS



in steel manufacture begin with efficient blast furnace operation. The very best design in HOT BLAST STOVES and STOVE CHECKERS pays handsome dividends on every installation. Repeat orders from the customers prove this fact.

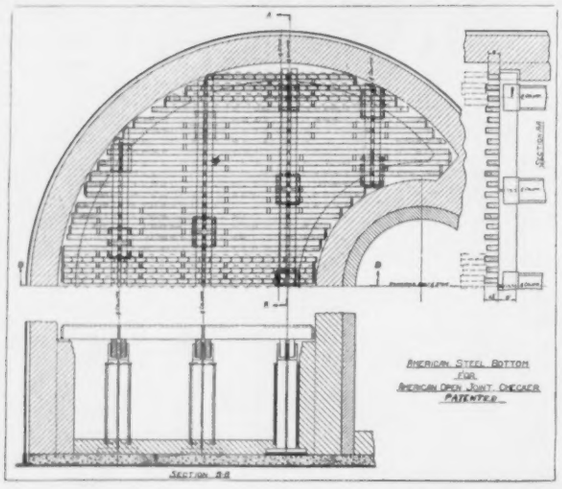
THE WELDED STEEL SHELL—Smooth inside shell surface—No leaking rivets.

THE HEMISPHERIC DOME—Allows the brick shell wall lining to expand and contract without interfering with Dome Brick.

THE TELESCOPIC SHELL—Allows for increasing insulation thickness in hot zones of stove without changing thickness of brick shell wall.

THE ROLLED STEEL FABRICATED BOTTOM—Supports checkers and eliminates upkeep of brick arches.

THE OPEN JOINT CHECKER—The checker shape that equalizes the flow of gases throughout the entire checker chamber, due to cross-circulation through the open joints.



Above—The Rolled Steel Fabricated Bottom.

Maximum Heating Surface Obtainable with Same Size Flue.

Maximum Brick Weight in Hot Zones of Stove

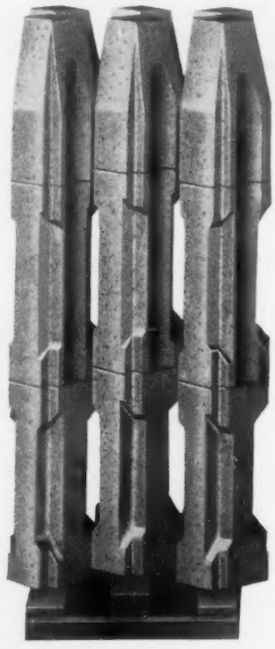
Complete Cross-Circulation of Gases

Channeling Eliminated

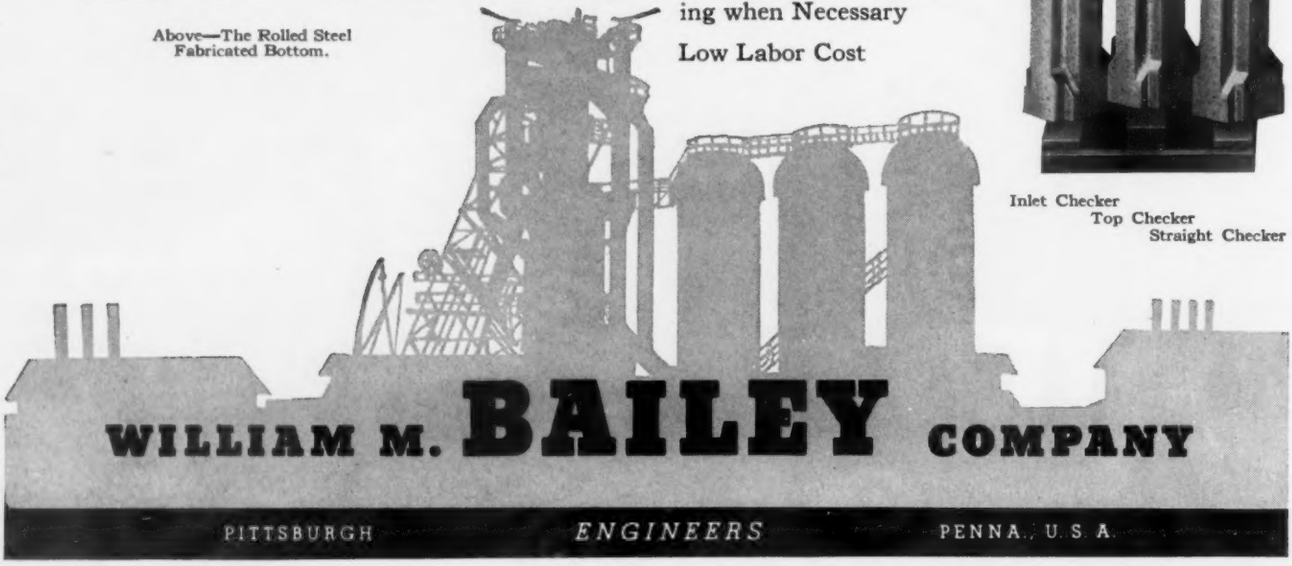
Clogging of Any Flue Entire Length Impossible

No Obstructions in Flue to Interfere with Cleaning when Necessary

Low Labor Cost

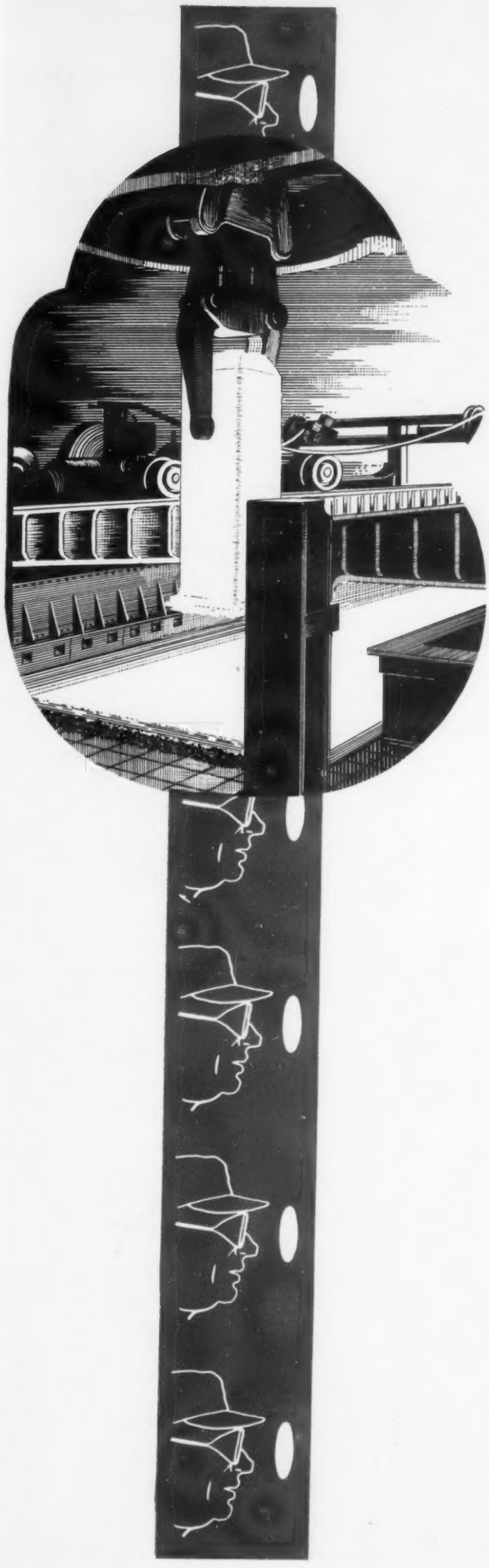


Inlet Checker
Top Checker
Straight Checker



WILLIAM M. BAILEY COMPANY

PITTSBURGH *ENGINEERS* PENNA., U. S. A.



PROGRESS IN STEELMAKING

■ WHILE operations were sharply curtailed in 1938, steelmakers devoted intensive effort to improving plant practice and reducing costs. Notable progress was made in these directions; in 1939, pressure will be exerted on consolidating and extending the gains. Every phase of steelmaking, from raw materials to finished steel, and blast furnace to rolling mill, has felt the march of progress. Today, as a result, materials, equipment, processes and product are under as close a control as man has been able to devise.

Slag control is now a definite tool in the production of steel in the open-hearth furnace, declares Earl C. Smith, chief metallurgist, Republic Steel Corp., Cleveland, who states that by its use both tonnage and quality are regulated with considerable precision. When melters become skilled in reading the signs on the slag cake, steelmaking operations will move forward to a new standard. The spread of the information which allows a melter to judge his lime-silica "V" ratio, probable manganese relations, and general conditions of iron oxide by observation will make him more useful and his operations of the furnace more sure.

Without the present understanding of slags, Mr. Smith contends, we probably would not have seen the introduction of new hearth materials based on pure magnesium oxide at this time. These new materials have definitely assured American steel melters of hearth refractories that are correct and manufactured completely from American material.

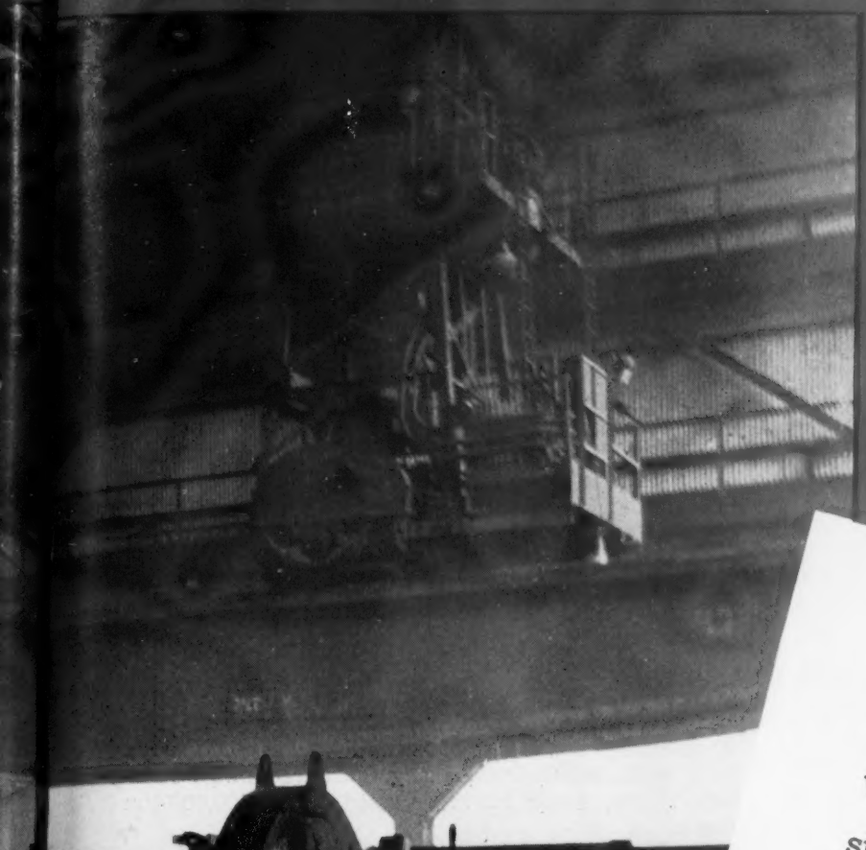
An important by-product of slag study has been development of the chromite materials for wider use. Simplicity of the ramming mixtures based on chrome ore, magnesite mixtures, Mr. Smith states, would have been extremely slow in developing if open-hearth men and refractory makers had not learned many of the relations of steel, slag, and hearth material well enough to move surely.

Developments announced many months ago were put to greater use by the open-hearth operator the past year, according to W. J. Reagan, Edgewater Steel Co., Pittsburgh. Breaking up slag pocket accumulations with

STRAIGHT BLAST FURNACE GA OV

SURFACE COMBUSTION CO

A OW USED FOR SOAKING PITS!...



WITH ALL ADVANTAGES OF AUTOMATIC CONTROL OF TEMPERATURE, PRESSURE, AND ATMOSPHERE

One of the outstanding steel mill developments in 1938 was the successful application of straight blast furnace gas to the heating of soaking pits. Ingots can now be heated just as fast in SC one-way fired pits using straight blast furnace gas as in conventional reversing pits using coke oven gas or other fuels. Let SC engineers tell you how you can utilize this outstanding development with all the advantages of automatic control of temperature, pressure, and atmosphere.

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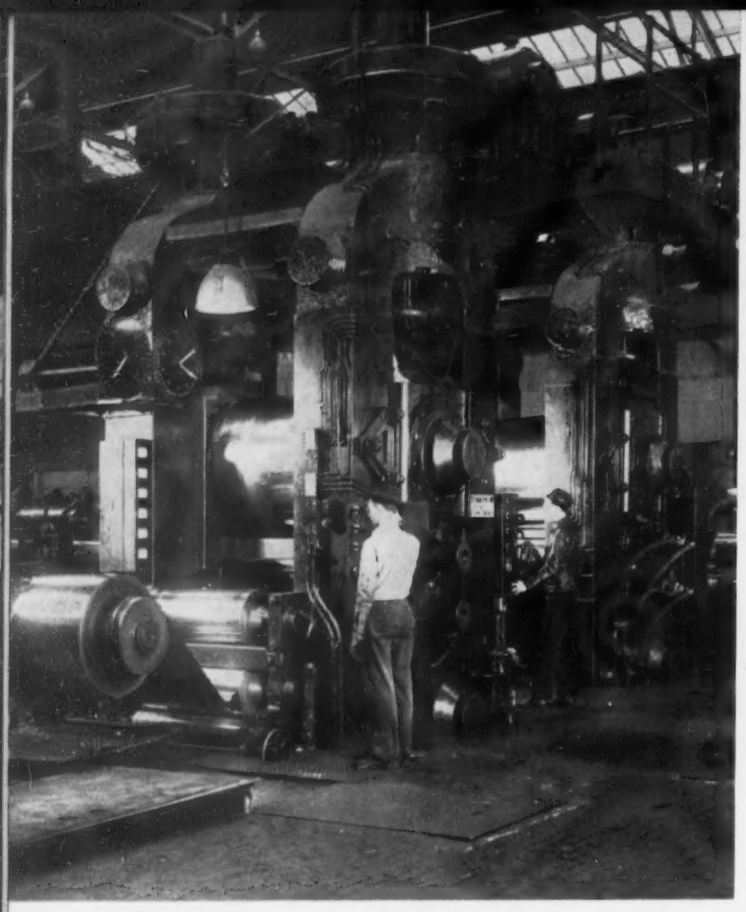

■ Shown here is the No. 3 two-stand tandem tin temper mill in the new Irvin works, Carnegie-Illinois Steel Corp., Clairton, Pa. Under construction during recent months, this plant opened formally on Dec. 15

CO_2 bombs is a rather unique method and results are promising. Use of chrome ore in basic bottoms has been on the increase. Welded steel ladles have shown nice profits, he asserts, allowing for greater yields from furnaces with no greater loads on cranes.

Improvements in the carbometer for rapid carbon determination and development of similar instruments of a much more simple type and at lower costs, appear to be problems that will be answered in the near future. New combinations of deoxidizers offer possibilities, in the opinion of Mr. Reagan.

C. D. King, United States Steel Corp., Pittsburgh, anticipates further refinement in process control in steelmaking, such as by controlled slags and oxidation, and by controlled pit-side practices. He cites the following trends in open-hearth practice: Increasing adaptability of liquid blown metal charges to steel production because of inherent advantages in purity of raw materials and flexibility of slag control; continued rehabilitation of furnaces to provide larger heats and installation of additional large-size furnaces; and continued application of automatic control equipment.

Trends likely to characterize pig iron manufacture this year, Mr. King states, are continued emphasis on beneficiation of raw materials; continued investigation of "acid" operation and external desulphurization of iron; and increased size of blast furnaces.

Since all major steel companies are now equipped with continuous mills with capacities exceeding present and anticipated demands for some time to come, W. G. Hildebran, assistant secretary, Wellman Engineering Co., Cleveland, believes the industry will now concern itself with savings to be accomplished in the steelmaking end. He anticipates much rebuilding and enlarging of open hearths, addition of new furnaces and replacement of old charging machines with modern ones of larger capacity and more rugged construction.

Wm. A. Haven, vice president, Arthur G. McKee & Co., Cleveland, directs attention to new blast furnace equipment consisting of a superimposed gas cleaner with a precipitator built integral and mounted above the primary scrubber. Advantages include reduction in ground space, foundations, piping and valves. Tests over many months show use of spherical refractories for the first 10 feet of checkerwork in hot blast stoves to be highly satisfactory.

Methods for concentrating Eastern magnetic ores have been improved to such an extent, states Mr. Haven, that this region is assuming new importance. He also mentions a new method of concentration in the Mesabi district which is augmenting recoveries and lowering costs. Beneficiation of Southern ores by crushing holds considerable promise. Concluding, he points out that the new system of bedding ores to reduce chemical irregularities and prevent segregation of sizes is particularly adapted to Southern blast furnace practice.

First all-welded blast furnace shell in this country is now being erected, reports Gordon Fox, Freyn Engineering Co., Chicago. Several welded stove shells have indicated their adequacy. Furnace linings show longer life, some having passed the 2,000,000-ton mark.

Value of rigid suspension of the large bell is receiving recognition. Facility for relieving this rigidity under stress, to prevent bending the large bell rod, is considered important. Mr. Fox directs attention to increased recognition being given to the influence on stock distribution of the speed of opening the bells. Equalizing of pressures above and below the large bell before opening now is accomplished through a by-pass valve which functions automatically immediately prior to functioning of the large bell hoist.

More Operating Information Is Provided

A new attachment for the continuous stockline recorder, termed a stock-movement-visualizer, virtually enables the operator to "feel the pulse" of the furnace. The gate-type hot blast valve, widely used at stoves for two decades, has undergone extensive redesign. Rubber is finding broad application in the cyclone gas cleaner as well as in the seat of the butterfly valve. Use of soda ash in administrating absolution to hot metal, tainted with sulphur above 0.05 per cent, is now routine practice in several plants, Mr. Fox reveals.

Increasing use of larger proportions of sintered iron ores in blast furnace burdens in this country and abroad, is noticed by R. H. Sweetser, consulting engineer, New York. New sintering plants for low-cost sintering of fine ores have been built in the United States, England and Italy. Mr. Sweetser mentions that wherever there are any stockpiles of old flue dust, the tendency is to use this dust as fuel mixed with current flue dust rather than to sinter the flue dust as rapidly as possible just to obtain seemingly cheap material for the blast furnace.

Information gained from a reliable source is that the proposal to operate blast furnaces under pres-

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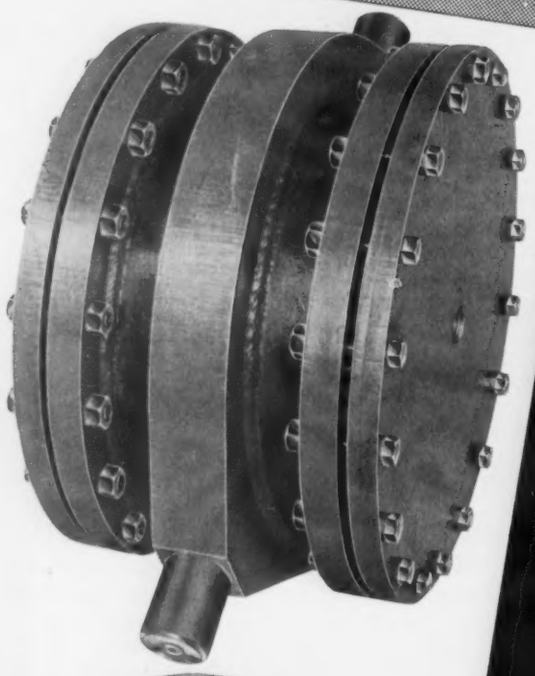

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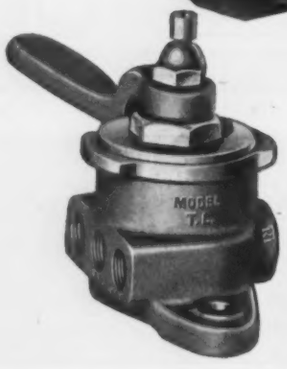

LOGANSPORT MACHINE, INCORPORATED
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sure is meeting with gratifying response. A strong likelihood exists that some sort of practical test will be inaugurated within the next few months.

Relative proportions of the five blast furnaces newly built or extensively rebuilt in the past two years approach those of stacks erected a decade or two ago, observes F. L. Lindemuth, chief engineer, William B. Pollock Co., Youngstown, O. He directs attention to the tendency toward installation of more effective gas cleaning equipment.

Hot blast stoves are larger than previously built units. In some cases, the dome lining is supported from the stove shell instead of from the sidewall lining. Means for preventing bottom bulging and lifting of the stoves from their foundations, Mr. Lindemuth explains, include an increased number of anchor bolts, dishing the bottoms, and bracing between bottom and shell.

Commenting on production of stainless steels, W. J. Priestley, vice president, Electric Metallurgical Co., New York, points to the growing realization of importance of correctly balancing alloying elements to gain better workability and service life. The austenite and ferrite forming properties of various elements are better understood as are effects of these constituents on workability, corrosion resistance and other properties. An increase in manganese content of the austenitic steel to 1½ to 2 per cent is found to improve materially hot working characteristics and to increase weld ductility.

More Molybdenum in Stainless Steels

Mr. Priestley points out there has been a more general use of molybdenum (2 to 4 per cent) in 18-8 stainless steels, and that columbium is now commonly used for eliminating susceptibility to intergranular corrosion. Columbium also is proving valuable for reduction of air hardening in the wrought straight chromium steels, such as the 4-6 per cent chromium and the 12 per cent chromium types. Nitrogen has been used to a greater extent for grain refinement in wrought high chromium steels.

Improvement of alloy steel quality is receiving increasing attention, comments Gilbert Soler, manager of research, Steel & Tube division, Timken Roller Bearing Co., Canton, O. Selection of best and most economical raw materials, development of proper equipment, new methods of processing, closer control of practice, and training of personnel, are problems which have attended the steelmaker.

More attention has been given to gases in steel, especially in rimming steels, and solidification and segregation of ingot structures has provided research. Carbometers and rapid methods of chemical analysis are in wider use, and during the year a method of carbon determination by coercive force measurement was developed, Mr. Soler mentions. Lessening of inclusions in steel to meet aircraft and automotive requirements has had its share of study. With the object of reducing fuel costs and furnace time, open-hearth operators have given more attention to combustion control equipment.

Steel Quality Under Better Control

L. L. Ferrall, metallurgist, Timken Roller Bearing Co., Canton, O., also comments on steel quality, stating that hardenability requirements and making steels which will pass the Magnaflux test are two problems receiving current attention. Progress has been made in hardenability tests which will indicate to the user the response of a steel to any one of a number of heat treatments.

The matter of making steels suitable for passing the Magnaflux test, Mr. Ferrall states, has been brought about mainly by the aircraft industry. Since it is difficult to apply this test to bars, billets or tubes and predict the outcome on some fabricated part, the steel manufacturer has had to apply other methods of examination to correlate results with those obtained on the finished part after magnetic testing.

A good deal of interest has developed in the revival of descaling steel billets and structural shapes by means of the scarfing torch. Although practiced to a limited extent about 15 years ago, says H. L. Rogers, manager, applied engineering department, Air

(*Please turn to Page* 314)

■ **Another open hearth heat nears the tapping stage. Furnace melter and his helpers are here taking a test sample. Photo courtesy Jones & Laughlin Steel Corp.**

MACHINING

■ DESPITE rather unsatisfactory business conditions which characterized the greater part of 1938, builders of machine tools and other metalworking equipment maintained a fair level of activity and made real progress in the development in improved designs of their machines and in tooling equipment. While employment during part of the year at least, depended to too great a degree upon sales foreign markets, the industry enters 1939 with some actual improvement—and with hopes for still greater improvement—in domestic sales.

Certain definite design trends continued, or appeared, during 1938. Those of the first mentioned group include: Electrical drive and control; further elimination of the "human element" and of undue physical effort from actual machine operation; widened range of speeds and feeds to accommodate not only the new cutting materials of today but also still newer ones which are liable to be developed in the immediate future; and redesign for better appearance and easier maintenance. In the second group come developments in production of superfinish on machined surfaces; and means of definitely evaluating the degree of finish.

In his role as president of the National Machine Tool Builders' association, W. E. Whipp—in contemplation of progress of his industry during 1938—pays the following tribute: "I think that the machine tool industry may well be proud of its designers. Theirs is a phase of our industry that is constantly at work. Even in a depression—perhaps I should say especially in a depression—the machine tool builder and his engineers are hard at it putting into their machines the new ideas that will make them more productive, more accurate, give them longer life, and afford greater safety to the operator.

"We need only set a machine tool of today next to its predecessor of ten years ago to see what great strides have been made in even that short period of time. Apparently no depression, no handicap, no emergency can retard this relentless quest of the machine tool builder for a better product.

"It is hard fully to conceive the value of this service to American industry. For these better machine tools

have built the equipment that has increased production in every field of industrial activity, and so led to a higher standard of living for us all."

J. W. Harper, machinery manufacturers section, General Electric Co., Schenectady, says: "During the past year several large machines have been put in operation which can be considered as being 100 per cent electrified. Several pit planers were furnished for export which incorporated a number of new features. Electric feed and power traverse are used throughout. Feed is automatically and adjustably controlled by a new limit switch designed for this service. Two conventional type planers and two plate planers were also equipped with this type of full electric feed control. In all these machines all the important functions are controlled through groupings of push buttons, either as pendent stations, or on panels on the machine.

"Boring mills have been put into operation on which, by means of suitable control equipment, the operator can set on dials the distance he wants the tools to move, horizontally or vertically, and have them stop at the predetermined point with uncanny accuracy.

More Complete Electrification Ahead

"While all these are large, heavy machines in which the manual effort to move masses would be considerable, they do indicate a decided trend toward complete electrification of machine tools. Furthermore, these are of a type not usually associated with much electrification, but the results obtained have more than fulfilled the builder's expectations. This trend is not at all confined to large machines, but is equally adaptable to much smaller units, where the manual effort involved is less, but the greater flexibility of operation and faster production schedules possible with the 'push button' machine tool are continually justifying its adoption."

A spokesman for William Sellers & Co. Inc., Philadelphia, makes this comment: "During periods of low volume business such as the machine tool industry recently has been experiencing, competition for orders causes over-emphasis of trends which basically are interpretations of customer requirements.

"One of such recent trends is that toward refinement of controls. It is possible that under the abovementioned pressure this is being carried beyond economical limits. Its fundamental soundness, however, will be demonstrated as business increases, and what actually is of value will then prove itself through reductions in setup and operating time."

J. R. Weaver, director of equipment, inspection and test, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., writes as follows: "During the early part of 1938, business receded to such an extent that equipment buying was materially reduced by American manufacturers. However, it did give an opportunity to machine tool builders to make improvements and changes that made machine tools better.

"I believe the machine tool industry has, during this last year, improved its machines to make them more efficient for use of the new cutting materials. Improvements were also made in lubrication and bearing construction, giving the machines more accuracy and rigidity. Speeds have been increased and operating efficiency improved.

"Detail parts today must be machined to a greater degree of accuracy and with materially improved surface quality. A demand is thus created for machines capable of producing these new requirements without greatly increasing costs. An example of this is the superfinish system recently developed by Chrysler Corp.

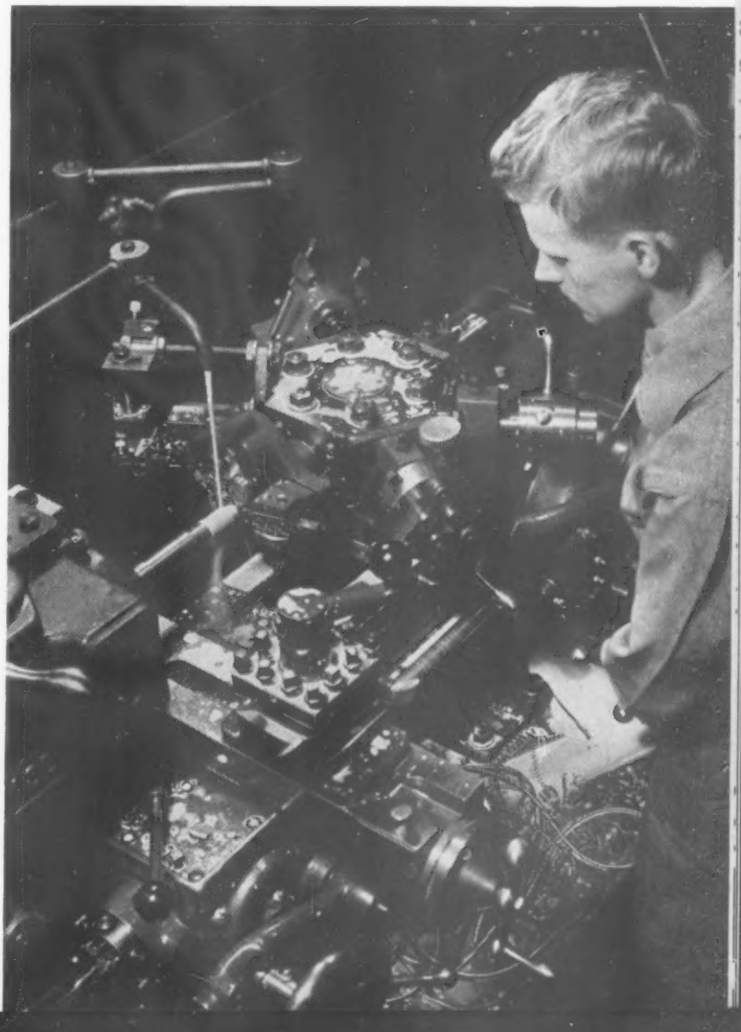
"Great strides have been made in automatic and semiautomatic lubrication. The operator depends almost entirely upon automatic lubrication on new machines. The result is that where machines do not have this feature, increased repairs are needed since the operator is apt to assume that no additional lubrication is required. Machine tool builders either should adopt fully automatic lubrication or should provide lubricating methods which are clearly evident and which require minimum attention."

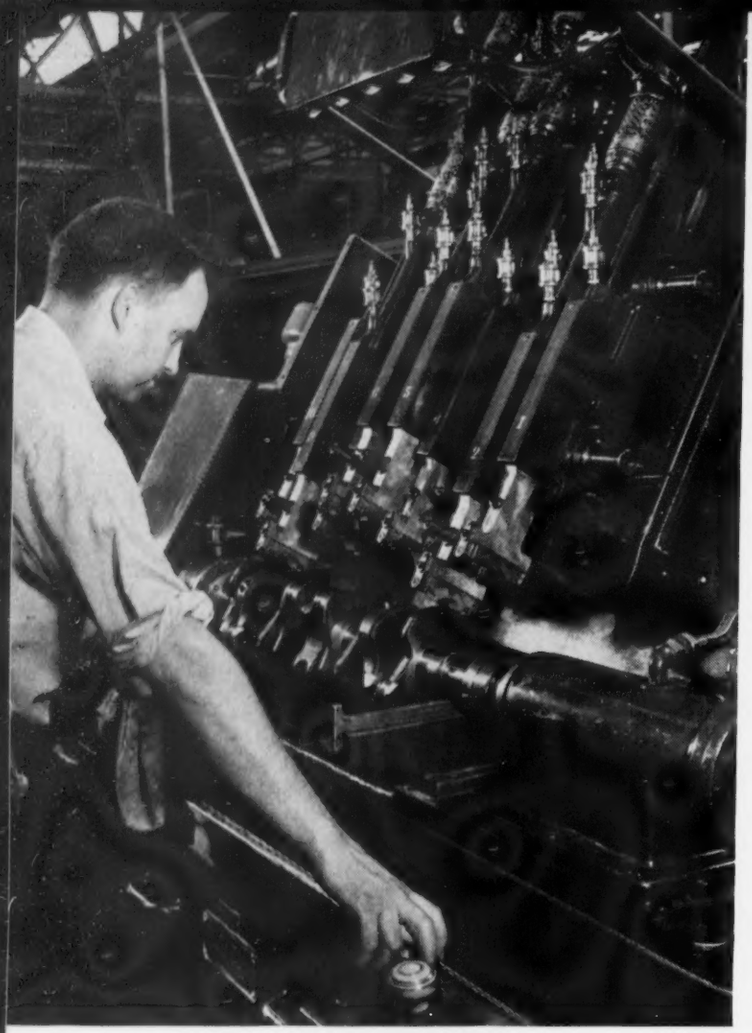
John E. Doran, sales manager, G. A. Gray Co., Cincinnati, sees industry facing a coming boom, and faced also with what he characterizes as the Herculean task of training a large number of competent operators of important general-purpose machine tools.

"This task of training operators," says Mr. Doran, "has to some degree been simplified in the latest designs by eliminating the human element in operation. In other words, thinking has to a large degree been done in advance by the machine designer, thereby leaving the mind of the operator free to concentrate on the best method of getting out the work.

"To be classed as really up-to-date, a machine tool also must embody sufficiently wide range of

■ **Having available for their use modern machine tools which afford higher productivity and greater accuracy, manufacturers can effect substantial savings in machining costs. Photo courtesy Warner & Swasey Co.**





■ **A new method for attaining extremely smooth surface finishes was introduced in 1938. Developed by the Chrysler Corp., Detroit, it is shown here being applied to rod bearings of a crankshaft**

speed to cover efficiently not only the top requirements of today, but also the still higher rates of production which the new cutting tools of tomorrow undoubtedly will make possible and necessary. In line with this, modern planers have cutting speeds as high as 150 feet per minute, although 90 feet per minute is about the maximum that can be employed to advantage on ferrous materials with present-day tools. While speeds above 90 feet per minute are now of value only on nonferrous materials, I am firmly convinced that these higher speeds actually will be used to advantage on iron and steel—literally before the new machine of today needs a new coat of paint."

H. S. Johnson, president, Gisholt Machine Co., Madison, Wis., comments as follows: "In my opinion, 1938 has been notable for a number of refinements in machine tool design. For instance, there have been further important modifications to permit more effective use of carbide cutting tools, and by the same token, tools made of new types of Stellite and the super high speed steels can be employed at speeds and feeds impossible on older model machines.

"Much attention has been given to simplification of operation so as to eliminate as far as possible the factor of operator fatigue. Noteworthy in this respect is the growing use of electrical and hydraulic mechanisms to do work which formerly imposed unnecessary physical strain on operators. I am impressed by the fact that during 1938 there has been a marked increase in the application of careful scientific research to the art of machine tool design."

"In my opinion," says C. W. Machon, sales manager, small tools department, Brown & Sharpe Mfg. Co., Providence, R. I., "the outstanding development in the machine tool field during the past year has continued to be the increasing use of electrical drive and control. The advantages of this co-ordinated type of drive and control are now widely recognized and with co-operation of builders of electrical equipment, new applications rapidly are being perfected. I anticipate that this design trend will become steadily more important throughout a period of a number of years to come.

The following comments are made by H. J. Griffing, sales research engineer, Norton Co., Worcester, Mass.: "Of major interest to the machine tool industry, particularly the grinding, lapping and finishing end of the business, has been developments in surface finishes and their measurements. That of the Profilometer by Dr. E. J. Abbott, Physicists Research Co., Ann Arbor, Mich., has provided a new instrument for measuring definitely the smoothness of surfaces.

To Develop Roughness Standards

"A committee is at work studying our standards for surface measurements, that is, the degree of surface roughness. Bear in mind that the maximum roughness allowed does determine the smoothness. It will be of great assistance to everyone to be able to specifically designate the 'surface roughness quality' desired on any product. Heretofore this has been more or less a matter of personal opinion as to how good the surface might be.

"There have been many articles appearing in the trade papers about methods of finishing and machines used for the purpose. Because of the publicity given this subject many engineers who have not been in close touch with the subject have gained the impression that high quality surface finishes are new and rather difficult to obtain on existing equipment. This, of course, is not true, because the machine tool industry as well as the general manufacturing industry where fine surfaces are required, have been using commercial lapping machines for producing work, not only with high surface finishes but to close dimensions for accuracy, for a number of years."

According to Walter Ferris, vice president, Oilgear Co., Milwaukee, development of surface broaching during 1938 has been rapid and important. "A large part of our engineering effort," says Mr. Ferris, "is devoted to hydraulic broaching machines, including the design of automatic feed devices. The design of control mechanisms has been extensively revised. This is true especially along lines of combined electrical and hydraulic mechanisms to insure maximum flexibility of operating cycles along with fool-proof operation."

D. A. Wallace, president, Chrysler sales division, Chrysler Corp., Detroit, points to the significance of improvements during the past year in surface finishing: "Equipment and methods for commercial applications of the new mechanical surface finish called Superfinish, have made tremendous strides," says Mr. Wallace. "The development of this equipment for removing the amorphous metal condition left

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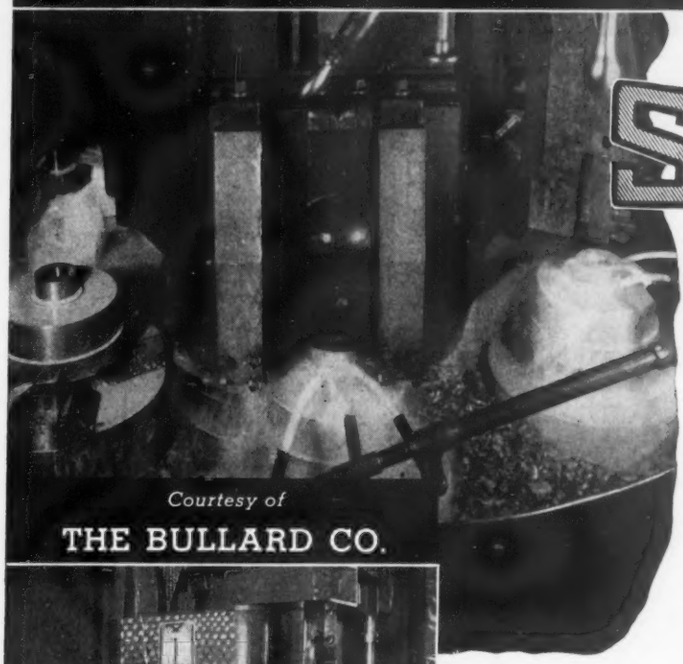
CHOICE OF THE LEADERS



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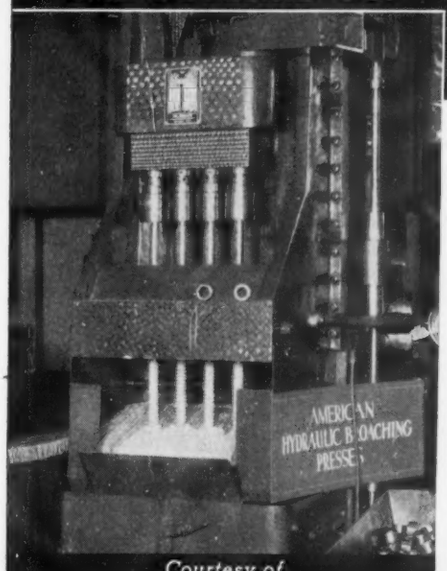

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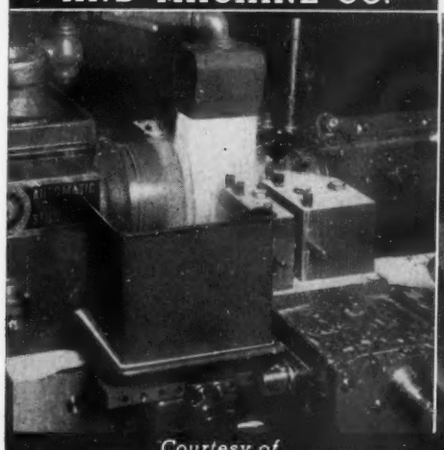

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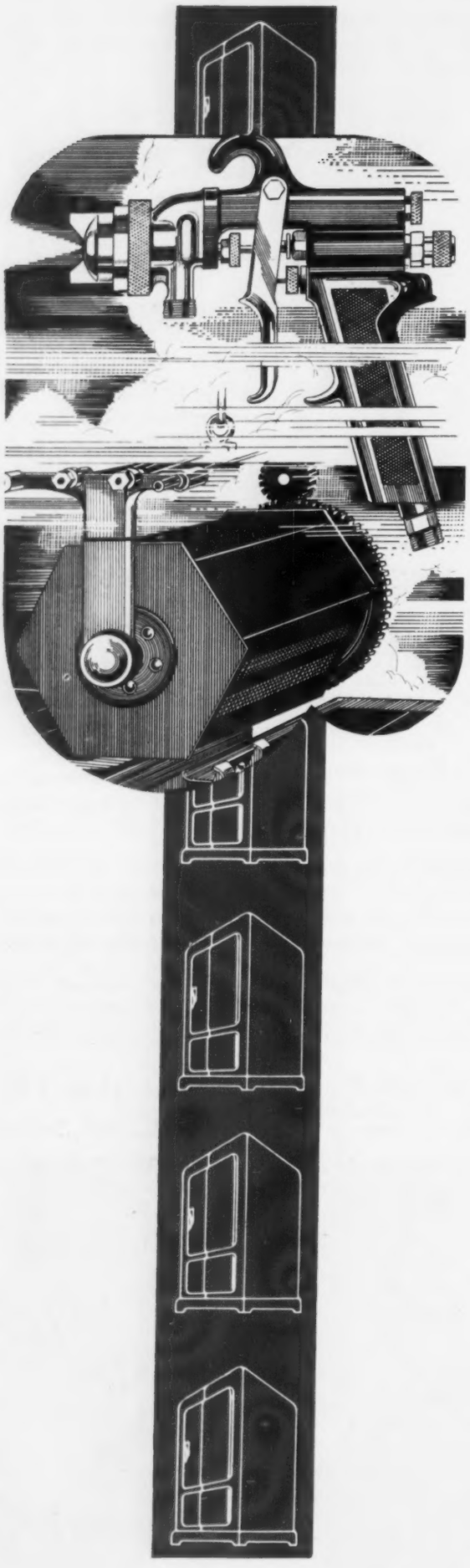

METAL FINISHING

■ WITH IMPROVED plating processes, galvanizing practice and equipment, primers, synthetics, porcelain enameling, lacquers, etc., 1938 indeed stands out as a year of progress in metal finishing. Other advances of the year have to do with color plating, pretreatment for rust prevention, automatic spray painting and several processes to increase wear resistance of metal surfaces.

To F. P. Romanoff, Apollo Metal Works, Chicago, the following important trends are evident. Simpler methods of removing all types of impurities in high speed plating baths by use of permanganate, activated earths, etc., are becoming a major factor in producing modern electrodeposited finishes. . . To keep pace with the greater use of fast bright nickel, a faster type of alkaline copper process has been developed—also a high speed zinc process. High speeds have emphasized adequate cleaning of the work.

Combinations of organic and alkaline cleaners for degreasing are becoming more common with important developments in this line in sight, Mr. Romanoff adds. With decrease in cost of prefinished metals, has come development of an edgecoating process to reduce rusting of unprotected edges and an improved adhesive paper to protect work in process. These are greatly extending the field of prefinished metals, he adds.

Reviewing the lacquer and enamel field, G. Klinkenstein, vice president and technical director, Maas & Waldstein Co., Newark, N. J., says, "A decided trend in 1938 was toward use of finishes that bake rapidly at high temperatures, 'speed up' finishes to meet demand for short baking schedules required for efficient, high speed, mass production." Several such synthetic enamels dry almost entirely by polymerization and at a critical temperature attain a hard, glass-like surface almost instantly.

"However," points out Mr. Klinkenstein, "with short baking schedules and high temperatures, control is more difficult so present tendency is to avoid extremely short schedules and adopt those combining speed with dependability. . . . Use of transparent colored coatings has greatly widened the field for use of die castings," he adds. Among new finishes introduced this year, he men-

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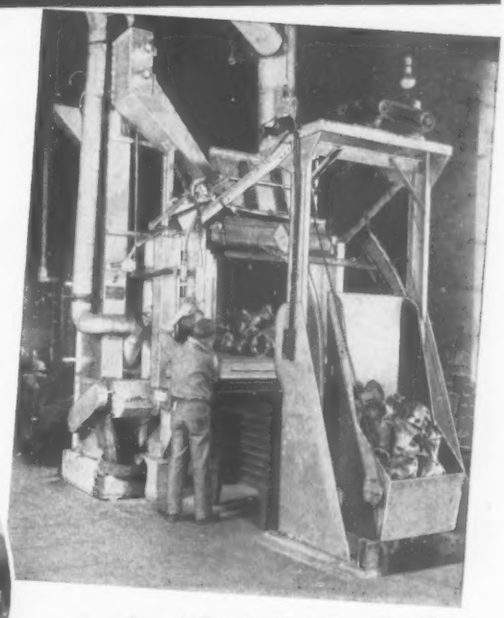
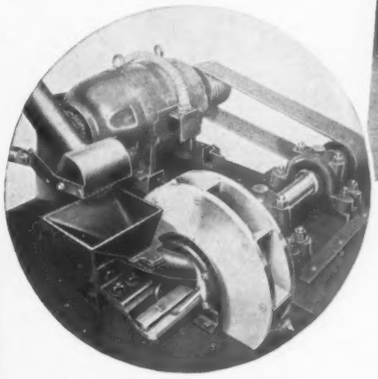
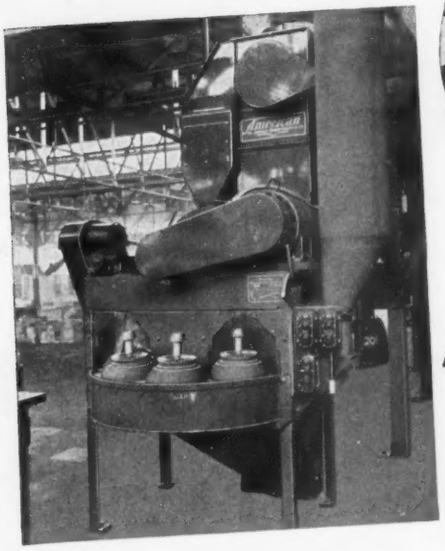


A 48″ x 42″ Wheelabrator Tum-Blast installed at the Dayton Malleable Iron Co., Ironton, Ohio. Tum-Blasts are made in 4 other sizes, having an operating load capacity of from 2 cu. ft. to 20 cu. ft.



The Wheelabrator Airless Abrasive Blasting Unit



A Wheelabrator No. 1 Multi-Tablast installed in a prominent automobile plant for cleaning heat-treated ring gears and splines. Supplied in 3 other models for handling work up to 48″ diameter.

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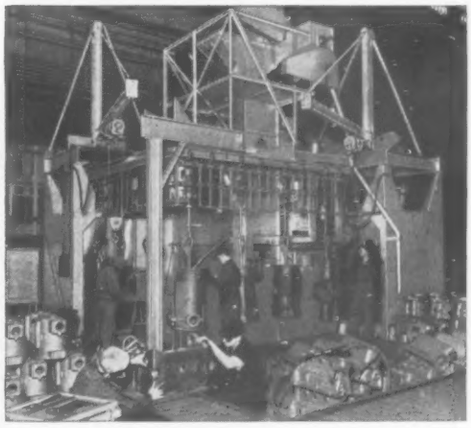
- Allis-Chalmers Mfg. Co.
- Great Lakes Forge Co.
- Walworth Company



A Wheelabrator Special Cabinet installed in the plant of a prominent manufacturer of agricultural equipment for cleaning tractor cylinder blocks.

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tions wrinkle finishes in whites and pastel shades, perspiration-proof lacquer, a metal finish for rubber and improved waterproof lacquers.

A significant advance in the enameling and japanning industry is brought out by Harry Forsberg, vice president, Japan Co., Cleveland, who says, "The up-to-date japanning and enameling shop is expert in using all types of finishes and in their effective application and so may efficiently handle manufacturers' finishing problems. This should eliminate manufacturers' experimental costs and many of their worries as to proper finish and application method because both materials and methods are preproved."

An interesting prediction is made by John Vassos, industrial designer, New Canaan, Conn., who says, "While many excellent metal finishes are available, they all have the one defect that abrasion or marring reveals the base metal, usually of contrasting shade or color. I predict that eventually there will be produced steel with color, sheen and texture as inherent qualities which will be retained irrespective of normal abuses received in use." Such material would have enormous possibilities.

Color Plating of Metal Progresses

Speaking of color, Alfons Bach, industrial designer, New York, says, "The many experiments this year in color plating have produced considerable progress but all accomplishments still lack softness and warmth. It is difficult to eliminate the metallic overbearing in the color effect. If new experiments will bring a different finish, I expect a revolutionary application of colored metal in industry and the home."

J. F. Barnes, Barnes & Reinecke, industrial designers, Chicago, also believes "Electroplating—particularly with reference to electrochemically deposited color—will reach its real value when ways are found to soften the colors which now are somewhat 'raw.' Definite trends are appearing toward use of natural permanent finishes, such as found on surface of stainless steel, monel, Allegheny metal and similar alloys, and toward use of satiny as opposed to polished surfaces," adds Mr. Barnes.

Benjamin Joachim, president, Joachim Research Laboratories Inc., Brooklyn, N. Y., points to the use of zinc dust in a primer for galvanized iron and says, "Although not exactly new, this year has brought forth definite results in this connection. A number of beautiful shades can be developed—all in one coat jobs. Zinc dust in a baking alkyd vehicle as a heat-resisting paint gives a finish similar in appearance to sherardized work and the zinc practically becomes part of the surface."

Threating To Give Rust Resistance

He adds, "Another outstanding development is pretreatment to prevent rusting underneath paint films. Most of these methods involve prepainting washes of phosphoric acid, with or without dichromate solutions. Some are simply allowed to dry, others are heated or given electrolytic treatment. . . Synthetic oils are now being produced by several manufacturers, a move to make this country independent of foreign sources. Such oil may eventually replace part or all of the China wood and Perilla oil coming from the Orient. . . A new Bakelite resin has been developed which dries so fast that structural steel may be primed in the shop and handled without loss of time, a valuable feature."

H. G. Doering, manager, Truscon Laboratories, Detroit, also emphasizes the importance of pretreatment to prevent rust formation under paint films. He says, "Recent invention of penetrative inhibitors to neutralize or "kill" the activity of any rust left on a steel surface before painting is one of the biggest contributions to surface maintenance of iron and steel yet developed. Since it is almost impossible to remove all traces of rust and since these traces result in rapid rusting even under a perfectly waterproof paint film, development of the powerful penetrating inhibitors available today is important."

Porcelain enameled steel sheet has great promise

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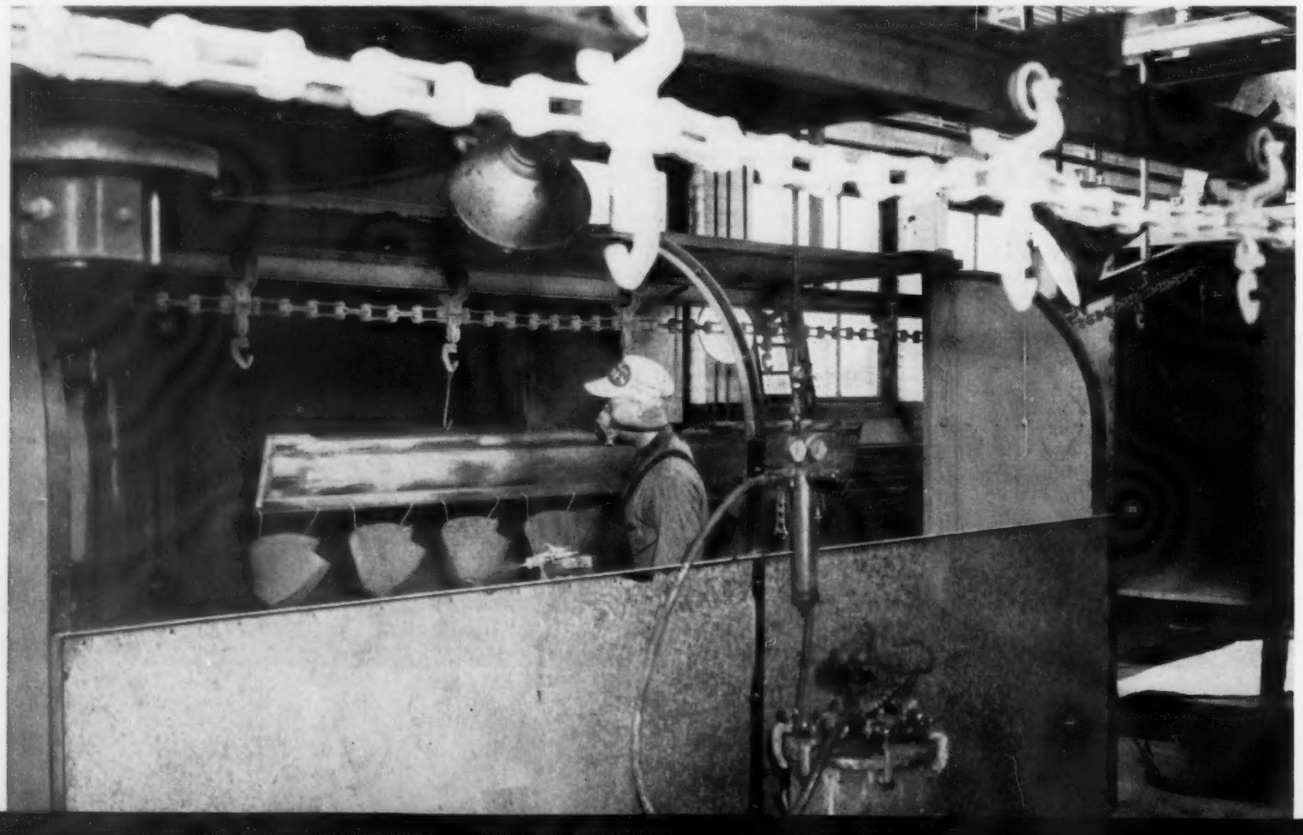
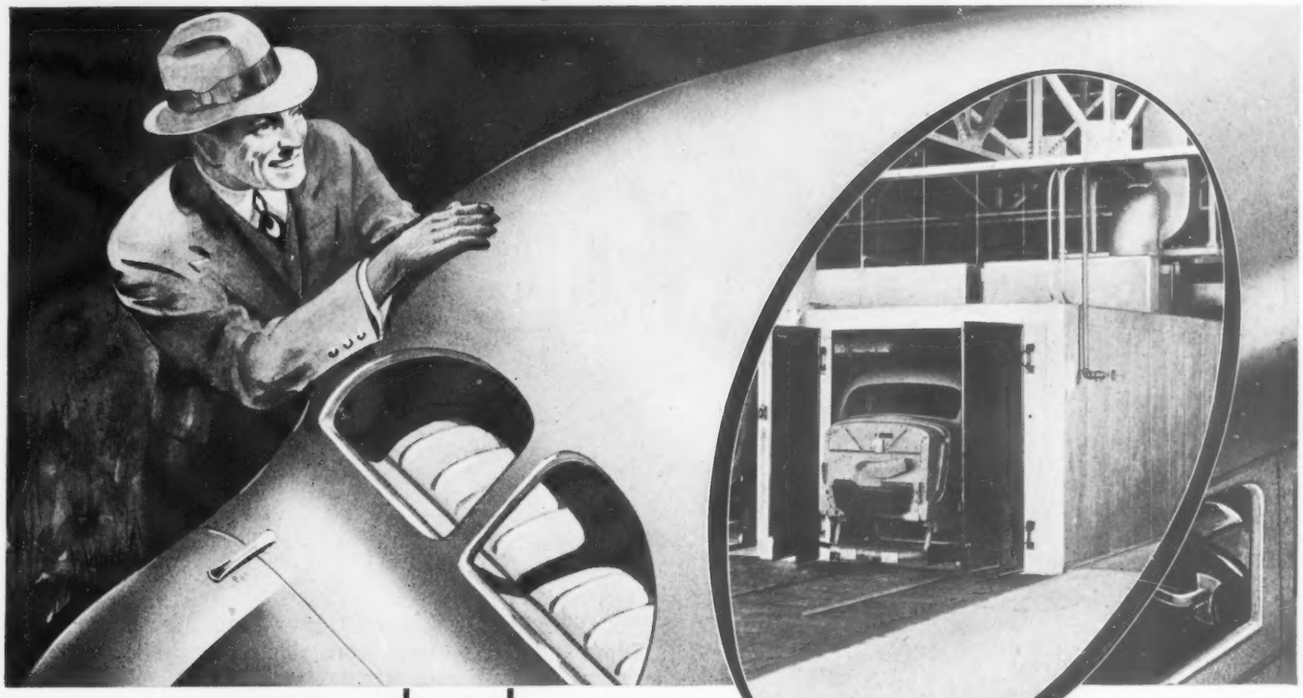


■ **Spraying is a popular method for applying finishes to metal products. This modern conveyorized spray booth is installed in the plant of the White Motor Co., Cleveland**

For that finish, mister...



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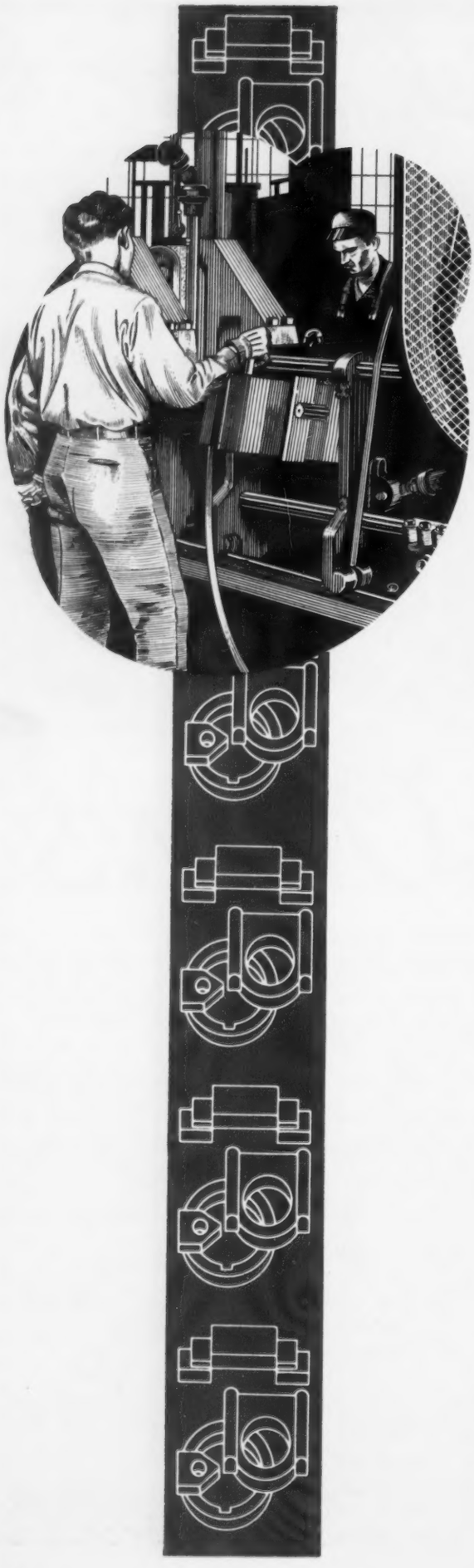

DIE CASTING

■ PRODUCERS of die castings—zinc, aluminum, magnesium, and brass—have been unstinting in their search for new fields of application for their product, for more diversity of outlets, as well as in their intensive cultivation of time-tested uses. To list a few of the products in which die castings are finding widening usage might be mentioned: Instruments, toys, radios, household appliances and specialties, bearings, tools of all types, fuel handling equipment, typewriters, packaging machinery, decorative novelties, and even such unusual applications as lawnmowers, flashlight reflectors and jewelry.

This list, of course, does not include automotive parts and accessories, the leading outlet for zinc-base castings for several years. Die cast radiator grilles appear on at least ten of the 1939 models, die cast hardware continues in abundance, while new applications include headlamp bezels, rotary door latches, a transmission case cover, glove compartment door, a direction signal indicator, radio grilles and control panels. Other locations in which die castings appear on automobiles are carburetors, fuel pumps, underwheel gearshifting mechanisms, vacuum brake assemblies, steering wheel hubs, horn rings and hood louvres.

R. Davison, manager, market development division, New Jersey Zinc Co., New York, observes that this diversity of use has been brought about in part at least by "advancements in design features—wider use of thin sections, greater complexity, closer tolerances, surfaces far more adaptable to plating and other finishes, and the careful use of webs and buttresses for greater strength and metal saving."

He sees as an encouraging development "the tendency for design engineers to contact die casters on new designs while they are still in the formative stage, saving many production headaches."

"Of all the die casting alloys, those based on zinc continue to lead all others combined in the ratio of about three to one or better," says Herbert Chase, consultant, Forest Hills, N. Y. "In fact," he notes, "the low cost

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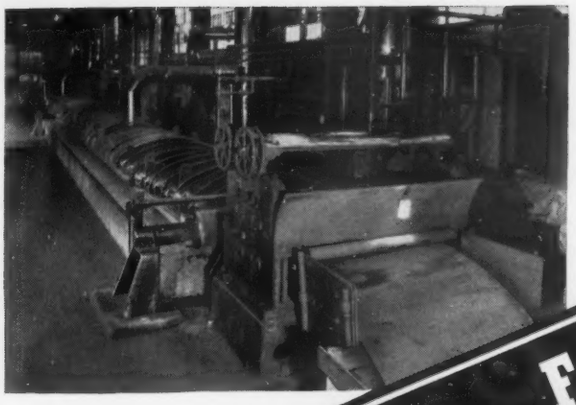

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LITHOFORM: Coats electro and hot-dip galvanizing, zinc die castings and cadmium plate, so that paint will adhere.

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CASTING

■ FACED with sharply reduced volume of business during 1938, foundries throughout the country gave special attention to problems of reducing costs and improving quality of castings. Careful scrutiny of all materials used, better control of melting procedures and improved correlation of all equipment were the order of business as the decline in operating rates focused attention on costs.

With regard to melting equipment, G. P. Phillips, foundry metallurgist, International Harvester Co., Chicago, points out that foundries made increasing use of air weight control devices, better metal weighing equipment, mechanical handling and charging devices, and covered and insulated mixing and transporting ladles. He also notes broader use of heat treatments of finished castings for stress relief, for softening and for hardening; and as a corollary the increased use of heat treatments for hardening has resulted in wider use of alloys.

Impetus has been given to mechanical methods for molding, according to Mr. Phillips. These methods have not resulted so much in increased production as they have in elimination of arduous manual labor.

Other indications of progress include more blowing of cores, more extensive cleaning of castings by airless shotblasting methods, better laboratory equipment for testing and control of raw materials and finished product, and a closer collaboration between designers and foundry supervisors. Mr. Phillips sees the future of the casting industry "as bright now as at any time in its long history."

Turning to the various subdivisions of the foundry industry, first consider the steel casting branch. C. W. Briggs, technical adviser, Steel Founders' Society of America, Cleveland, reviews the year's technology and notes several valuable contributions. They include the third report of the steel casting committee of the British Iron and Steel institute, containing studies on fluidity of iron-carbon alloys and steels, properties of copper-steel castings, and additional data on strength and ductility of cast steel during cooling from the liquid state in sand molds. Valuable information on the use of aluminum for deoxidation without sacrifice of ductility in steel castings was another contribution. Reports on design and relief of

stresses in steel castings contained important data for engineers, while studies on the effect of alloys and heat treatments on the mechanical properties of castings were pursued actively.

Important in advancements registered in steel foundry practice, according to Mr. Briggs, was the progress made in furthering the combination cast-weld type of construction whereby complicated structures can be produced by welding together a number of steel castings. Also significant was the advance made in centrifugal casting of steel, such as practiced by the Ford Motor Co., where ring gears and transmission step gears currently are being cast centrifugally in volume lots. Research into the properties of sands for steel casting manufacture also has developed helpful data.

Higher physical properties, sounder metal, closer tolerances and finer finishes typify strides being made in steel casting, in the opinion of Marshall Post, vice president and works manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., and president, American Foundrymen's association. He gives due credit to the co-operation of suppliers and equipment builders, and also to the research work emanating from technical institutions.

Overcoming Aluminum Embrittlement

Explanation of aluminum embrittlement in cast steel and discovery of at least a partial remedy for it, mentioned previously by Mr. Briggs, are re-emphasized as important metallurgical contributions, by John Howe Hall, consulting metallurgist, Philadelphia. He sees technical papers presented during the year on this subject as milestones on the road to elimination of this vexatious difficulty in the manufacture of steel, especially acid electric steel.

Mr. Hall also refers to the importance of introduction of the Randupson method of molding in steel casting, involving the use of cement-bonded sand molds. Research has perfected a means of eliminating one troublesome problem in this process—sand burning on, and as a result large savings in cleaning room costs have been achieved.

"An understanding of the potential physical properties of cast-to-form articles, their controlled realization as a result of good steelmaking practice, use of alloy content where necessary and economical, and development of accurate heat treatment are factors of real importance in defining casting trends," states F. A. Melmoth, vice president, Detroit Steel Casting Co., Detroit. He adds that "improved and expanded heat treatments have been a further significant factor, because the limiting effect of a reliance on simple annealing is disappearing. Multiple treatments of the normalize and draw, quench and draw types, with differential treatments to produce varying degrees of hardness in different areas of a casting, have become commonplace, he points out.

"Concurrently the adaptation of flame-hardening practice to steel castings, a treatment to which they are ideally responsive when of correct analysis, is opening new fields of applications continually."

Pearlitic Malleable Field Widens

One of the greatest single contributions of the malleable iron industry during the year has been development and exploitation of pearlitic malleable irons. Metallurgists and engineers daily are probing new uses for this material which, by virtue of its high strength, good response to heat treatment and fine wearing qualities, is definitely one of the brightest stars in the malleable firmament.

W. H. Doerfner, general manager, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich., re-echoes these sentiments, and cites one specific case of how pearlitic malleable iron has overcome the problem of servicing pistons in diesel engines used in the new high-speed streamlined trains. Other new uses for pearlitic malleable include valve rocker arms for two current overhead-valve automotive engines, camshaft for another automobile engine, large stamping press frames, and the like.

In the estimation of H. A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland, the versatility of pearlitic malleable as a material is demonstrated by the rather wide variety of properties desired for various purposes and the correspondingly wide range in service conditions to which pearlitic malleable produced by different vendors is suited.

Mr. Schwartz adds, "Perhaps as the years go by there will be some possibility of the standardization of

(*Please turn to Page* 303)

■ **With foundrymen taking advantage of recent improvements in materials and production processes, tomorrow's castings will be superior in quality**

Raw MATERIALS

■ THE STEADY increase in Lake Superior iron ore shipments from the 1932 low was checked last year, when the amount moved by vessel was only 19,263,011 tons, a decline of 69.2 per cent from 62,598,836 tons in 1937. This was the sharpest drop in the history of the ore industry, with the exception of 1932, when the movement was 85 per cent less than in 1931.

While it is difficult to estimate 1939 requirements at this time, consensus is that shipments will be 40,000,000 to 45,000,000 tons.

Based on the present rate of consumption, shippers estimate total stocks at lower lake furnaces and docks May 1 will be approximately 22,000,000 tons, compared with 33,676,333 tons May 1, 1938. A normal carryover at the opening of navigation is about 15,000,000 tons.

Stocks at Lake Superior mines Dec. 31, were approximately 8,000,000 tons. This indicates a reversal of the recent trend which recorded a gradual decrease from the all-time record of 16,408,000 tons Dec. 31, 1932 to 5,200,000 tons at the close of 1937.

Lake Superior iron ore at furnaces and lower lake docks Dec. 1, 1938, was estimated at 36,000,000 tons, considerably less than the 42,625,954 tons Dec. 1, 1937. Largest stock of iron ore accumulated at the end of shipping season was in 1922, totaling 44,004,201 tons.

Iron ore consumption in 1936 is estimated at 26,012,000 tons, compared with 53,996,000 tons in 1937, 44,639,000 tons in 1936 and 30,789,000 tons in 1935. Highest consumption on record was in 1929 when 63,645,000 tons were used.

Domestic scrap consumption fell in like proportion, only 19,000,000 gross tons being used in 1938, half the 1937 figure of 38,006,000 tons.

Scrap exports also decreased. Exports for the first ten months last year were 2,406,392 gross tons, compared with 3,517,508 tons in the corresponding period of 1937 and 1,936,132 tons in the like period in 1936. Japan was the outstanding buyer in all three years, taking 1,058,065 tons in the first ten months last year, and 1,864,916 in the corresponding period of 1937. United Kingdom was the second largest importer of scrap from the United States.

Scrap imports for the initial ten months last year amounted to 13,183 tons, against 77,941 tons in the like period in 1937. Practically all came from Canada.

Coke production for ten months last year was 25,872,000 net tons; in 12 months of 1937, 52,375,000 net tons were produced; in 1936, 46,275,000 tons. These figures compare with record 1929 output, 59,883,000 tons.

By-product coke capacity was increased last year by completion of more than 300 new ovens. Several other batteries will be placed in operation early this year. Beehive coke activity was depressed and during the first ten months accounted for only 2.8 per cent of total output, compared with 6 per cent during 1937.

Lake shipments of limestone are estimated at 5,000,000 net tons, compared with 14,429,000 tons in 1937, and 12,080,000 tons in 1936.

Indicating the tremendous volume of raw materials required by the steel industry, the American Iron and Steel institute calculates such materials in 1937 represented 21 per cent of all rail freight traffic. Railroads hauled nearly 162,000,000 net tons of ore, coal, limestone and steel scrap; 3,000,000 cars were required to carry the tonnage.

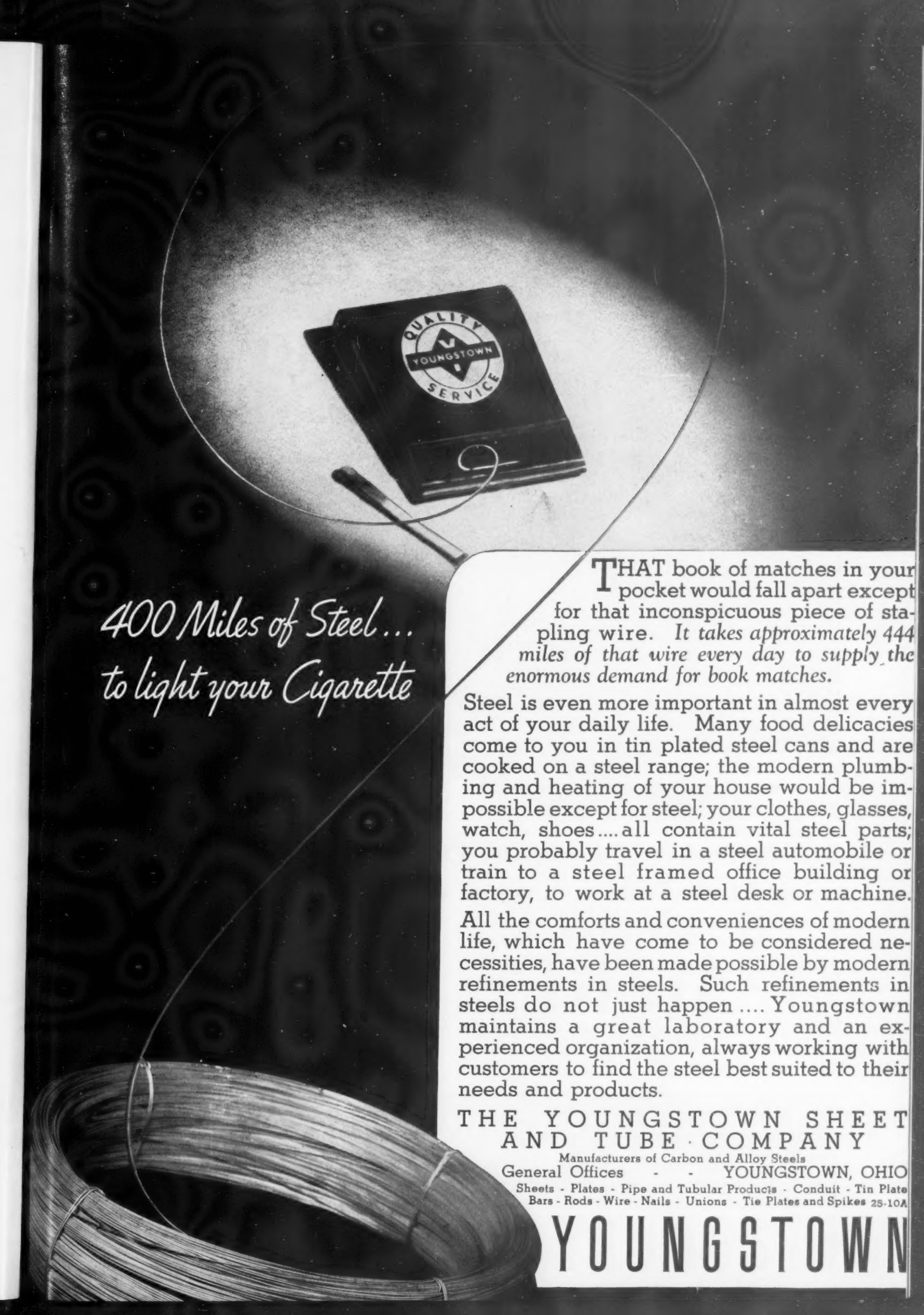
Ore, Scrap, Coke, Limestone Statistics

(All figures in thousands of tons)

	Lake Superior Iron Ore Consumption	Lake Superior Iron Ore Vessel Shipments	Domestic Scrap Consumption	Total Coke Production	Lake Shipments Limestone
1938.....	26,012*	19,263	19,000*	25,872†	5,000*
1937.....	53,996	62,598	38,006	52,375	14,429
1936.....	44,639	44,822	36,358	46,275	12,080
1935.....	30,789	28,362	26,415	35,141	9,082
1934.....	22,113	22,249	.....	31,821	7,392
1933.....	18,115	21,623	.....	27,589	6,664
1932.....	10,283	3,567	.....	21,788	3,928
1931.....	24,114	23,467	.....	33,728	7,208
1930.....	45,192	46,582	.....	48,302	12,432
1929.....	63,645	65,204	.....	59,883	16,269

*Estimated. †Ten months.

Iron ore and scrap, gross tons; coke and limestone, net tons.



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All the comforts and conveniences of modern life, which have come to be considered necessities, have been made possible by modern refinements in steels. Such refinements in steels do not just happen .... Youngstown maintains a great laboratory and an experienced organization, always working with customers to find the steel best suited to their needs and products.

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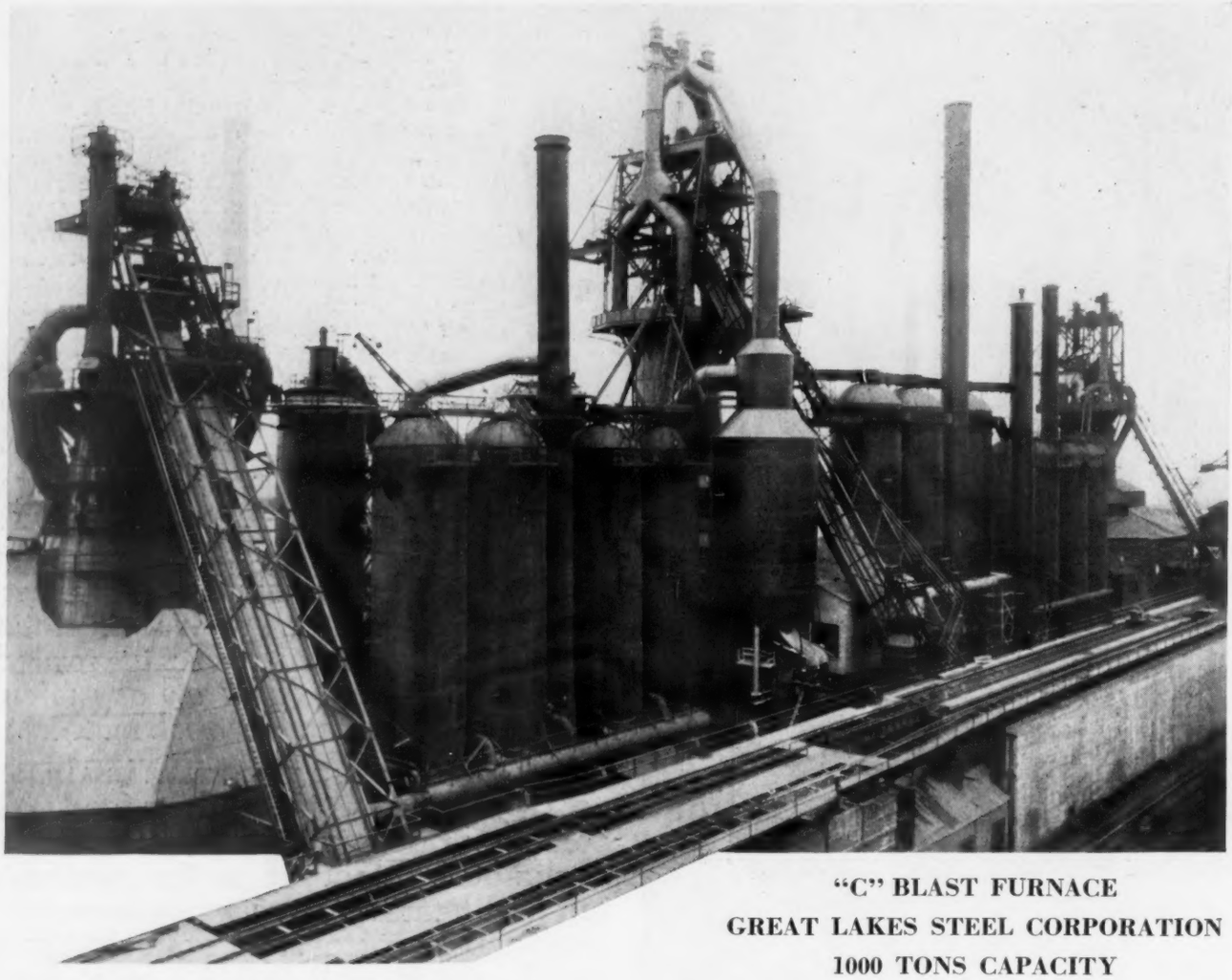

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Steelworks EXPANSION

By JOHN D. KNOX
Associated Editor, STEEL

Steel ready to run the gamut of processing departments—steel concocted by sweaty men who drew upon their skill to tap out the heat with the chemical elements matching those specified by the customer

■ BACK in the council chambers of the steel industry where the "higher-ups" meet regularly to discuss the problems thrown into their laps concerning the future operation of their properties, the light switch at the exit isn't snapped off as early as is customary. Adjournment is delayed. Important questions are gunning for solution.

All eyes are trained on the horizon of tomorrow. How does the weather look from an operating standpoint? Is the sky over yonder smokestacks and forges red and lowering, indicative of foul weather, or is the sun rising in all its splendor in the business world?

As the shadows of uncertainty endeavor to flicker across the council table they are made to vanish either by words of caution or buoyant utterances from the lips of those whose duty it is to direct the affairs of the company.

Deliberations are interrupted by the usual "seventh-inning stretch" and as all eyes gaze out the windows in the meeting room and scan various departmental buildings memory fleets back over yesteryear. At the turn of 1933, little donkey engines snorted thin columns of steam into the air as they expended their energy to swing huge columns and girders into the desired positions. Workmen scurried here and there like busy ants as they followed instructions formulated on the drafting boards some months before.

Millwrights took the last turn on the housing nuts to anchor the mill firmly on its shoes and then hung up their wrenches on the rack. Electric cranes glided over their runways, came to rest and deposited wide coils of ribbon-like steel at the shipping end. Yes, another wide stripsheet mill was dispatching its product into the channels of consumption—a mill that called for 500,000 tons of steel from the open hearth annually.

To the right of the new strip mill lay the steelmaking shop and memory continued to focus the picture sharply upon the minds of those at ease for the moment. Smoke could be seen curling from the stacks above the sheet steel roof of the open-hearth shop—smoke that at times was milky white, later changing to a deep brown and finally clearing so as to expose little waves of heat units that had escaped to dance their way into space above.

Yes, steel was being made on a quality basis but since the new mill started to turn over the open-hearth has had no spare tonnage. Furnaces had been enlarged to maximum melting capacity but still no overage to accommodate the blooming mill when the whistle signaled to rush along an ingot. And yet the slack had to be taken up. If an emergency should arise would there be sufficient steelmaking capacity to meet the needs of the hour?

These giants of industry scanning their plant holdings now fixed their attention to a mass of tangled steel just beyond the mold yard. Had there been an accident? No, it was just another blast furnace that had toppled to the ground under the increasing blows of taxation. Cheaper to light a fuse than to step up to the tax window and remit for a silent sentinel.

In the midst of this buckled heap blue goggled men moved their hissing acetylene cutting torches across rusty steel. Under the intense heat of the penetrating flame the molecules were driven apart and scattered. Truck-loads of material move into the stockhouse of the open-hearth department.

If the occasion ever arises where it is necessary to install additional furnaces over in the open hearth

will the ironmaking capacity be ample? Was our judgment sound when we authorized the scrapping of that stack to conserve our cash position? These were the questions of the moment.

Looking beyond the pox-marked blast furnace site where streams of golden metal once flowed onto the profit side of the ledger a mass of refractory material held together by steel buckstays met their gaze. There they stand—by-product coke ovens that once were acclaimed the most modern ovens money could build but now rebuilt and patched. Fuel of cellular structure still being pushed from the ovens into the quenching car on the other side but a red tag flutters in the breeze to warn the pusher operator to use undue care in moving the ram in and out of the compartment. Ovens still in service but their condition only fair.

If an emergency should arise, then what? Suppose larger finishing capacity necessitated the installation of new open hearths or further enlargement of existing units. Suppose the skips at the blast furnace were compelled to make a few more trips to and from the receiving hopper at the top of the stack or the speed of the turboblower increased in order to feed a larger volume of air through the blowpipes into the melting zone. Suppose "slow-blowing" became a thing of the past or a new stack pointed its bleeders skyward—would the present by-product setup be in a position to pass sufficient coke over the wharf to maintain full bins at the blast furnace?

Have we ample protection in the future in the way of steel, pig iron and coke against a sudden turn in market requirements? If not, are present conditions opportune for sweeping improvements to protect present plant holdings and to maintain our position in the front ranks with our competitors?

These are the problems with which management is wrestling today. Multiply this setting ten times —yes, twenty times—and you have the groundwork for the year just ahead so far as new construction in the iron and steel industry is concerned.

In the last half of 1938, several steel producers clamped down on expenditures for new improvements in order to conserve their cash position and at the same time to put some semblance of cheer into quarterly statements. On the other hand, a few companies drew upon surplus or from proceeds obtained through bond issues and inaugurated plant improvement programs that were planned after careful consideration.

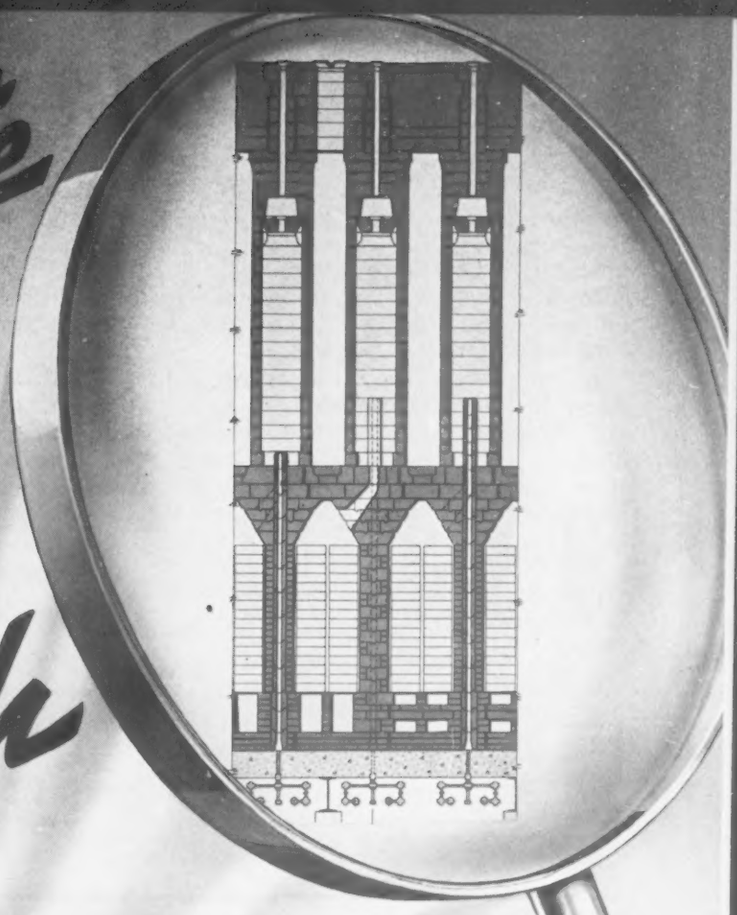
At the moment the air is charged with an attractive number of projects.

Sales engineers have estimate sheets in their portfolios cluttered on both sides with figures and sketches. A new blast furnace plant here, an ore-cleaning project there. Three or four programs of improvement at blast furnaces and a replacement and revamping steelworks program if and when funds are available.

Government questionnaires recently have been placed in the hands of by-product coke producers, thus reflecting its interest in the coking industry as an integral part of our national defense program. Should an emergency arise every by-product plant would have the earmarks of a munition plant since it could deliver explosive material from the back

The new and the old on their way to the steelworks mixer—open and closed top cauldrons of molten iron that soon will be converted into steel to meet trade demands

The Otto-Wilputte UNDERJET HIGH-LOW BURNER Coke Oven has Strength



Starting with foundations that avoid movement of pinion walls under expansion, every part of the Otto-Wilputte Oven is designed for the sturdiness which assures long service.

Each heating wall is supported by a thick pillar wall, built of interlocking shapes, and since there are no horizontal gas ducts to contend with, the interlocking extends to the top of the corbel.

Horizontal flues are shorter and reduced in size and are also built of interlocking shapes.

Many refinements have been incorporated in the Otto-Wilputte Oven but never at the expense of endurance. We will gladly furnish complete details to operators interested in modernizing or increasing their carbonizing capacity. Send for a catalog.

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door as well as a long list of other by-products suitable for warfare.

The problem of national defense in this country rapidly is coming to the forefront and if it becomes necessary to marshal the assets of the American steel industry because of the armament program, then coke oven builders, blast furnace designers and rolling mill operators may well roll up their sleeves and bend low over drafting boards.

At the moment there are some promising jobs before contractors catering to the iron and steel industry. Whether these jobs will germinate into actual business is a matter of conjecture. Nevertheless there is a feeling that some sizable plans will be released from the "front office" before the passing of many months.

New construction completed in 1938 or in the state of building at the opening of this year follows:

CARNEGIE-ILLINOIS STEEL CORP.

Completed

Pittsburgh District: Construction of Irvin Works, including equipment for production of cold reduced sheet and tin plate products and hot rolled sheets, and steelmaking, slab rolling and electric power transmission facilities.

Edgar Thomson Works: Improvement to blast furnace "I", including relining.

South Works: Blast furnace blowing, electric power and steam generating facilities. Three additional soaking pits, lengthening slab yard, three additional cranes, at 44-inch slabbing and blooming mill.

Ohio Works: Relining and improving blast furnace No. 4 and auxiliaries.

Gary Sheet & Tin Works: Four electrolytic cleaning lines in cold reduction departments.

Underway

Edgar Thomson Works: Rebuilding and improvements to blast furnace "K" for production of ferromanganese. Improvements to blast furnace "F," including relining.

Duquesne Works: Enlarging blast furnace No. 3, including relining. Three new stoves and relining and improving blast furnace No. 4.

Mingo Works: Relining and improving blast furnace No. 4 and stove No. 15.

Ohio Works: Reconstructing gas washers and auxiliaries, vibrating screens and automatic weigh hoppers for coke screening and weighing, and relining blast furnace No. 2. Stockhouse, charging machines and runway, charging box cars, hot metal ladles and tracks for stocking and charging facilities at open-hearth department.

South Works: 66,000-volt electric power transmission lines between South and Gary Steel Works, including transformer and switching facilities. Mold conditioning building and equipment and additional slag yard crane for ingot molds at Open Hearth No. 4. Improving electrical switching equipment, extending electrical distributing system and relocating transformers. Improvements to electric furnace plant, relining Ajax furnaces, including new bottoms, additional sheeting to protect stock and relocating 24 swing frame grinders.

Gary Steel Works: Relining and improving blast furnace No. 2 and auxiliaries. Relining blast furnace No. 10 and improvements to two gas washers and furnace auxiliaries.

Gary Tin Works: Two-stand tandem temper mill, tandem mill converted from single-stand temper mill and flying shear line.

Clairton By-Product Coke Works: New benzol refining plant, including improvements to auxiliary equipment.

NATIONAL TUBE CO.

Completed

Lorain Works: Relining and improving blast furnace No. 1.

(*Please turn to Page* 322)

Equipment Completed or Building in 1938

Open-Hearth Furnaces Completed

Company	Number of furnaces	Rated capacity, tons	Annual capacity, tons
Great Lakes Steel Corp., Ecorse, Mich.	4	150	342,800
Inland Steel Co., Indiana Harbor, Ind.	5	150	428,500
Republic Steel Corp., Gadsden, Ala.	2	125	160,000
Total	11		931,300

Blast Furnaces Completed

Company	Number of furnaces	Daily capacity, tons	Annual capacity, tons
Great Lakes Steel Corp., Ecorse, Mich	1	1000	345,000
Inland Steel Co., Indiana Harbor, Ind.	1	1000	345,000
Total	2		690,000

Bessemer Converters Completed

Company	Number	Rated capacity, tons
Northwestern Barb Wire Co., Sterling, Ill.	2	15

Blast Furnaces Dismantled

Company	Name
Bethlehem Steel Co., Lackawanna, N. Y.	"H"
Reading Iron Co., Reading, Pa.	Keystone
Total	2

By-Product Coke Ovens Completed

Company	Number of ovens	Type of ovens*	Est. annual coking cap., tons
American Rolling Mill Co., Hamilton, O.	15	K-B	94,200
Colorado Fuel & Iron Corp., Denver, Colo.	41	K-B	257,400
Great Lakes Steel Corp., Ecorse, Mich.	130	S-S	752,000
Republic Steel Corp., Youngstown, O.	69	K-B	434,700
Total	255		1,538,300

*Type of ovens: K-B, Koppers-Becker; S-S, Semet-Solvay.

By-Product Coke Ovens Building

Company	Number of ovens	Type of ovens*	Est. annual coking cap., tons
Carnegie-Illinois Steel Corp., Gary, Ind.	140	O-W	1,030,000
Ford Motor Co., Dearborn, Mich.	61	K-B	385,000
Total	201		1,415,000

*Type of ovens: O-W, Otto-Wilputte; K-B, Koppers-Becker.

Rolling Mills Completed

Company	No. mills	Type mills
Acme Steel Co., Riverdale, Ill.	1	29" 4-high cold strip
Acme Steel Co., Riverdale, Ill.	1	29" 2-high cold strip
Allegheny Steel Co., Brackenridge, Pa.	1	22" 4-high cold strip
American Rolling Mill Co., Zanesville, O.	1	3-high sheet
Carnegie-Illinois Steel Corp., Braddock, Pa.	1	48" slabbing
Carnegie-Illinois Steel Corp., Gary, Ind.	1	38" edging
Carnegie-Illinois Steel Corp., Clairton, Pa.	1	85" hot strip
Carnegie-Illinois Steel Corp., Clairton, Pa.	3	84" 4-high cold strip
Carnegie-Illinois Steel Corp., Clairton, Pa.	3	84" 2-high cold strip
Carnegie-Illinois Steel Corp., Clairton, Pa.	1	84" 4-high cold strip
Carnegie-Illinois Steel Corp., Clairton, Pa.	1	54" 4-high cold strip
Carrel Steel Co., Chicago	1	14" merchant
Carrel Steel Co., Chicago	1	10" merchant
Cold Metal Process Co., Youngstown, O.	1	7½" 4-high cold strip
Columbia Steel Co., Torrance, Calif.	1	24" edging
Continental Steel Corp., Kokomo, Ind.	2	62" 3-high sheet
Continental Steel Corp., Canton, O.	1	62" 3-high sheet
Empire Sheet & Tin Plate Co., Mansfield, O.	1	58" 3-high sheet
Ford Motor Co., Dearborn, Mich.	1	60" 4-high hot strip
General Motors Co., Lockport, N. Y.	1	18" 4-high cold strip
Great Lakes Steel Corp., Ecorse, Mich.	1	blooming
Great Lakes Steel Corp., Ecorse, Mich.	1	10" skin pass
Inland Steel Co., Indiana Harbor, Ind.	1	44" 4-high hot strip
Jones & Laughlin Steel Corp., Aliquippa, Pa.	1	tube reducing
McLouth Steel Corp., Detroit	1	28" 4-high cold strip
McLouth Steel Corp., Detroit	1	26" 2-high cold strip
Northwestern Barb Wire Co., Sterling, Ill.	1	12" 3-high merchant
Otis Steel Co., Cleveland	1	77" 4-high cold strip
Otis Steel Co., Cleveland	†1	77" 4-high hot strip
Republic Steel Corp., Cleveland	1	98" 2-high skin pass
Spang-Chalfant & Co., Inc., Ambridge, Pa.	1	buttweld
Superior Steel Corp., Carnegie, Pa.	1	30" 4-high cold strip
Superior Steel Corp., Carnegie, Pa.	1	30" 2-high cold strip
Tennessee Coal, Iron & R.R. Co., Fairfield, Ala.	1	45" blooming
Tennessee Coal, Iron & R.R. Co., Fairfield, Ala.	1	48" 4-high hot strip
Tennessee Coal, Iron & R.R. Co., Fairfield, Ala.	2	4-high cold strip
Thompson Wire Co., Chicago	1	10" cold strip
Universal-Cyclops Steel Corp., Bridgeville, Pa.	1	24" hot strip mill
Universal-Cyclops Steel Corp., Bridgeville, Pa.	1	24" 3-high cold strip
Wallingford Steel Co., Wallingford, Conn.	1	16" 2-high cold strip
Wheeling Steel Corp., Portsmouth, O.	1	56" hot sheet
Wheeling Steel Corp., Portsmouth, O.	1	56" cold sheet
Youngstown Sheet & Tube Co., Campbell, O.	2	tube piercing
Total	50	

*Remodeled. †Single stand.

Rolling Mills Building

Company	No. mills	Type mills
American Rolling Mill Co., Middletown, O.	1	45" 2-high blooming
Granite City Steel Co., Granite City, Ill.	1	48" 4-high skin pass
Granite City Steel Co., Granite City, Ill.	1	48" 4-high cold strip
National Tube Co., McKeesport, Pa.	1	cold sizing
Weirton Steel Co., Weirton, W. Va.	*3	32" 3-high structural
Youngstown Sheet & Tube Co., Ind. Harb., Ind.	1	46" 2-high blooming
Youngstown Sheet & Tube Co., Ind. Harb., Ind.	5	48" 4-high cold strip

*Additional.

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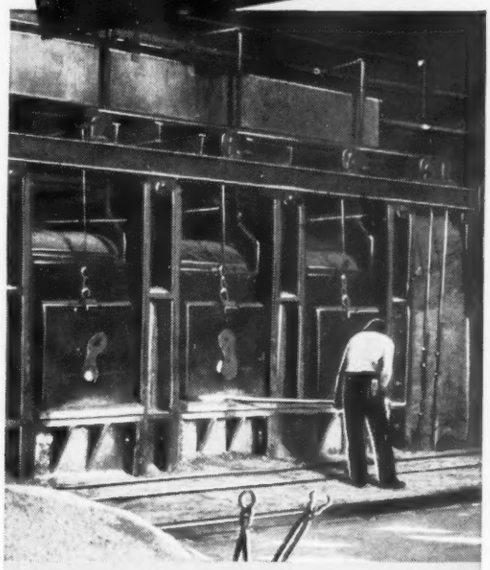
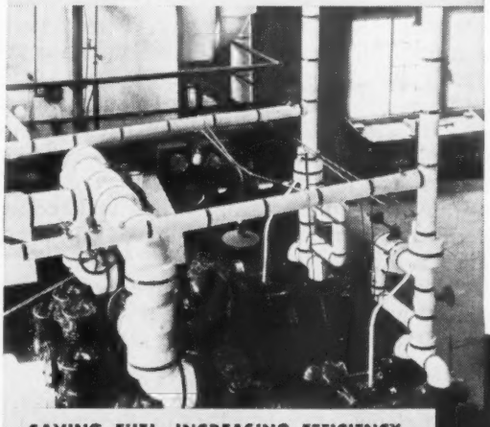
Over a quarter of a billion dollars . . . that is the staggering amount J-M Insulations save American Industry *every year* by reducing fuel and refrigeration costs. And here is how you can be sure your plant receives its full share of this huge saving . . .



$11,000 ANNUAL SAVING — In 1927, the regenerators and flues of this open-hearth furnace in a large Ohio steel foundry were insulated with Johns-Manville materials, applied in accordance with the recommendations of a J-M Insulation Engineer. The net fuel savings *every year* have been more than 400% of the cost of insulation.



SAVING FUEL, INCREASING EFFICIENCY —This power plant is typical of hundreds all over the country that are saving thousands of dollars in fuel annually because all their equipment and piping is correctly insulated with the right types and thicknesses of J-M Insulations.

THERE is only one way to assure maximum fuel savings and greatest operating efficiency . . . that is by using the *correct thickness* of the *right insulation* for every service.

And there is one sure way to solve the problem once and for all . . . call in a J-M Insulation Engineer. Let him study your requirements . . . if your present insulations are correct, he'll tell you so. If not, he will prepare a complete recommendation showing the most efficient and economical types and thicknesses of insulation for every piece of equipment in your plant. Furthermore, he'll be glad to prove just how they will give you better heat or refrigeration control and save you money far beyond their cost.

Back of these engineers stands Johns-Manville's 80-year leadership in the development and manufacture of insulations . . . the largest, best equipped Thermal Insulation Laboratory in the world . . . and a complete line of insulating materials in block, brick, cement and pipe-covering form for every temperature, for every service condition.

Why not phone for a J-M Engineer today? His services are free . . . and you'll find one or more in every large city throughout the country. Or, for complete details on J-M Insulating Materials, write for Brochure IN-55A. Address Johns-Manville, 22 East 40th Street, New York, N. Y.

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INDUSTRIAL INSULATIONS
for every temperature . . . for every service condition

Railroads

(*Concluded from Page* 143)

the past few years has augmented passenger train power materially. Diesel units also continue the most popular type among new orders for switching engines. While until recently the diesel locomotive has confined its application to passenger and switching service, Electro-Motive Corp., La Grange, Ill., leading manufacturer in this field, has announced it will introduce a locomotive for freight service this year.

Steam power continues to offer strong competition in both the freight and passenger field. A new candidate in this respect is the turbo-electric type of steam unit, recently perfected by General Electric Co. after several years' development and scheduled for operation by the Union Pacific railroad this year.

Prospects for increased buying of track material, cars and locomotives in 1939 hinge largely on the trend in railroad revenues. In view of the impaired credit of many roads, government aid is the only other source likely to furnish the means of financing extensive improvement programs.

The direct relation between railroad income and spending has been apparent for years. Since 1928 and including the first nine months of 1938, net railway operating income averaged a little more than $602,000,000 annually, while orders for materials and equipment averaged about $624,000,000. Income gains in 1939 consequently may be expected to be accompanied by rising orders for materials and rolling stock.

While an increase in freight traffic of some proportions seems assured this year in view of the depressed 1938 volume and the second-half recovery of industrial activity, it is impossible to estimate accurately the probable rise.

Favorable factors in the outlook include the anticipated upturn in building construction—an industry employing the railroads extensively in the transportation of materials—and the reduction in excess inventories of various bulk commodities, particularly coal. In a measure these heavy stocks were responsible for curtailed freight traffic during a large part of 1938. Loadings of farm commodities, on the other hand, are expected to do no better than approximate the relatively heavy 1938 movement.

Appliances, Miscellaneous

(*Concluded from Page* 151)

struction or have been contracted for. The navy program also includes a considerable number of auxiliary and smaller craft.

Both the merchant marine and the navy program are subject to upward revision, depending on the turn of events abroad.

Aircraft construction was active throughout 1938. An active 1939 is assured by the government's plans to build up the army and navy fleets to possibly 10,000 to 12,000 ships.

Although the government's program still is in the formative stage, it is expected to necessitate a tremendous expansion in aircraft plants, will require a large amount of new tools and equipment as well as steel and other metals for actual construction.

As 1938 ended, the war department was continuing industrial mobilization with a view to streamlining munitions and war equipment procurement in event of an emergency.

Machinery and machine tool builders felt the 1938 depression keenly and sales fell far below the 1937 record levels.

Ten months' average index of the National Machine Tool Builders' association was 97.4, scarcely more than half the corresponding figure for 1937 of 186.9. Last year's first ten-month-average, however, was a little higher than the 1933-37 average of 96.6.

After dipping to 66.7 in May, a gradual recovery started and gained momentum through the year. Continued industrial improvement may set off a wave of re-equipping in the spring, many machine tool builders believe.

Encouraging to tool manufacturers is the tremendous need for replacement of obsolete equipment. Builders are advising their customers to place orders now for equipment which will be needed this year, and avoid delayed deliveries when volume tool buying is resumed.

Export demand for tools and industrial machinery was active, especially during the early months of 1938. For many types of equipment, foreign orders exceeded domestic sales.

Steel Exports Lower

Iron and steel exports in 1938 were about 37 per cent below the 1937 high, but still were above normal. Foreign shipments, excluding scrap, for the first ten months totaled 1,786,624 gross tons valued at $116,638,208, compared with 2,867,340 tons valued at $179,258,254 in the corresponding period in 1937.

Largest tonnage item exported was pig iron with 373,846 tons, compared with 719,666 tons in the 1937 January-October period.

Best customer was Japan which bought 384,836 tons; Canada took 173,506 tons and the United Kingdom, 117,519 tons. Kwantung, Philippine Islands, Venezuela, Brazil, Russia and the Netherlands each bought more than 50,000 tons in the ten months.

Prospects that other countries will continue to come knocking at the United States' door requesting large tonnages of iron and steel products are not too bright.

Several steel producing nations which during the last two years have bought some products in the United States to augment their domestic output now are operating at less than capacity and, in the immediate future at least, will be under no necessity to import.

Several of these, having increased capacity, are seeking export markets for themselves. Their lower wage scales and willingness to barter will make competition difficult for American producers.

Germany especially is looking toward South American and other markets. Her production capacity increased by development and annexation, the reich is anxious to trade iron and steel products for raw materials—South American nitrates, beef, wheat, coffee and rubber. Unusual concessions are offered in an attempt to obtain a firm foothold.

Other European producers which have been using their own output or selling to rearming neighbors now have idle capacity, are ranging farther from home in search for markets.

Japan's dealings with Germany, lack of money, drift toward self-sufficiency, development of domestic capacity and the passing of peak demand presages a smaller market in the Orient.

Development of Pan-Americanism and possible establishment of more favorable exchange arrangements may be expected to direct more attention toward markets in the western hemisphere.

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Complete cleaning of Blast Furnace Gas by Cottrell Electrical Precipitators has made this valuable fuel available for use in underfiring coke ovens, heating soaking pits, small checker stoves and open hearth furnaces and for other metallurgical and economic purposes.

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Editorial

Many Laws Need Revision

■ STEEL'S survey (p. 130) of the effects of the rules that now govern business reveals that sharp revisions are needed to pave the way for smoother functioning. It shows clearly that hastily conceived and badly administered laws impose burdens that prevent a return of industrial activity on a scale justified by our wants, our resources and our capacity to produce. Many of these laws were intended to promote happiness and security and, in particular, to elevate the scale of living of those in the low income brackets. They have had an opposite effect.

Nobody quarrels with the objectives of the social security law. But the act as now set up is proving a distinct burden. It has contributed to unemployment by layoffs where taxes have proved too formidable. It has reduced public purchasing power by an amount equivalent to the huge taxes collected under its provisions. And our tax problem of the future becomes more aggravated because the tax monies thus taken in go to help finance the federal deficit. The social security drains off a considerable portion of our earnings without promoting real security.

Our Tax System Discourages Industrial Enterprise

At a time when the shortage of capital in industry is estimated at fifty to seventy billions of dollars, businessmen generally are agreed that the securities act of 1933 and the securities exchange act of 1934 have contributed materially toward damming the flow of new money into industry. Though designed for the protection of investors through correction of abuses in the creation and issuance of new securities and subsequent trading in them, they contain provisions that are unnecessarily severe and hence hold back business expansion.

Although the undistributed profits tax was eliminated and the bad effects of the capital gains tax considerably ameliorated by the last congress, business complains about high taxes and tax inequalities. The present tax system discourages investors, reduces public purchasing power and holds down the volume of business. The whole tax system should be overhauled so as to produce needed revenue in ways that will least impair the business structure.

In substance, the Walsh-Healey act, which applies to government purchases coming to more than $10,000, restores the wage and hour controls of the defunct NRA without providing any of the latitude of code days in price posting. The administration is using this law in an attempt to dictate minimum wages higher than many manufacturers can afford to pay. If it stands by its present schedule, many employers will be prevented from bidding on future government requirements, or they will be encouraged into insolvency by paying higher wages than warranted.

Business Needs Better Insight Into Real Effects of New Rules

The national labor relations act, the wages-hours act and other laws might be similarly cited for their braking effects on business. Nearly 100 government corporations and agencies with vast powers of competition with private enterprise and investment impinge harmfully on business in many ways. A particularly baleful feature is that many of these government activities are so complex and ramified that, if continued as now organized, their real character will not be revealed for a long time to come.

One of our troubles today is that the average business man generalizes in condemning laws that now hamper business. What is needed is a universal understanding as to why some of our existing laws are bad and how they should be corrected. The facts summarized in this issue of STEEL constitute at least a fair background for such a study. The effort involved will be more than repaid as more business men make sound recommendations to those of our legislators, increasing in number, who are genuinely interested in helping business.

The BUSINESS TREND

Extension of Recent Gains Anticipated During 1939

■ OUTSTANDING in the record of business for 1938 is the fact that for the first time since 1932 industrial activity failed to record an increase over the preceding year. This condition is reflected in STEEL'S index of activity in the iron, steel and metalworking industries. The annual average recorded by the index was 50.3 in 1932, 59.7 in 1933, 67.6 in 1934, 79.9 in 1935, 96.2 in 1936, 104.1 in 1937 and approximately 74 in 1938.

The trend of industrial activity during the past year recorded two distinctly opposite movements. The first six months saw the continuation of the sharp downward spiral which got under way in May, 1937, but in the last half of 1938 a definite upward movement was reflected in all industrial barometers.

Since last June the volume of industrial production has increased rapidly and vigorously. The upward movement of industrial activity in this brief period, as recorded by STEEL'S activity index, recovered approximately 56 per cent of the ground lost in the unprecedented decline during the 13 months ended June 30, 1938. In this 13-month period from May, 1937 to June, 1938, the monthly average of STEEL'S index of activity fell from 121.7 to 63.4. In November last year the monthly average of the index was 95.9.

The year 1931 affords the closest recent comparison with the trend of industrial activity during 1938. In that year the annual average of STEEL'S index of activity was 68.5, compared with the indicated average of approximately 74 during 1938. The indicated average of about 85 in 1938 for the Federal Reserve board's index of industrial production also closely compared with the 1931 average of 81.

Of the four weekly and 14 monthly business factors for which statistics are presented on the following pages not one affords a favorable showing in 1938 compared with 1937. In every instance the monthly or weekly averages indicate a recession from the previous year. Building contract awards made the best comparable showing with the previous year, but this condition was almost entirely the result of government pump-priming.

However, the prospects are not as dark as the foregoing seems to indicate. Examination of the month-to-month fluctuations of most industrial indicators since July 1, 1938 reveals a moderate upward movement through the summer months followed by a mild spurt during the latter part of the year.

As we enter 1939 the unsolved problems are many, but industry is in a much stronger position to cope with them than a year ago, when business activity was in the midst of the sharpest downward spiral yet recorded. Inventories have been reduced considerably, and the federal pump-priming activities are expected to reach a peak this spring with the resultant stimulation to the consumers' goods industries as also the building industry.

From the charts presented in this section of STEEL, it is evident that the encouraging recent gains in industrial activity have developed without the desirable aid of the capital goods industries. Industrial plant expansion involving new construction and the purchase of heavy equipment is still at a low ebb, although some improvement along these lines should materialize this year. An indication of this lack of activity among the so-called heavy industries is the low volume of capital bond issues during the past year.

Many railroads are barely meeting fixed charges. Until the carriers are able to make a considerably higher return on their investment, they will remain an obstacle to the recovery movement. It is encouraging to note some of the beneficial policies for the carriers that compose the major recommendations of President Roosevelt's railroad program committee. Whether all or only a portion of these recommendations will be acted on, some form of federal assistance for the railroads during 1939 is anticipated. Some utilities are reluctant to go through with expansion programs, already on paper in a few instances, until the threat of government competition and restrictions ceases to prevent free capital investment.

The anticipated increase in commodity prices which usually follows a cyclical rise in industrial activity is long over due. However, a gradual uptrend in

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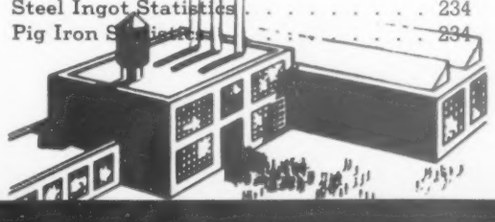


prices for industrial commodities is expected during this year, but a flare-up of inflation is not likely, nor is an accumulation of excessive inventories, as witnessed during 1936 and 1937, expected during the coming year.

The adverse nonbusiness factors which handicapped general industrial activity in 1938 are still present. The continued government deficit and the threat of a European war will remain as a drag on the long term prospect for general business activity. However, despite these adverse obstacles, the year 1939 is expected to record a moderate improvement over last year.

Since the trend of business during the latter part of 1938 was based primarily upon the consumers' goods industries the outlook for 1939 holds considerable promise. If greater co-operation between government and business, as indicated by the changed political complexion of congress, is manifested at the coming session of congress, private capital may flow more freely into investment, with resultant benefits to the capital goods industries.

The improvement experienced in the last six months represents this nation's second attempt at recovery from the long depression. In both instances the federal government has depended heavily on stimulating industrial activity by means of pump-priming. This method of reviving business activity has proved unsatisfactory, largely because it has failed to encourage private investors to put private capital to work.

In the past seven years only about one-third of the steel output has consisted of heavy products such as plates, beams, rails and castings, used for construction, railroads, power plants, machinery and production equipment. This definitely indicates the lethargy existing in the heavy industries through the depression years. Balanced prosperity cannot be achieved through efforts which promote activity in consumer goods but hinder it in the durable goods industries. Government expenditures for power projects, dams, flood control, etc., are but a feeble substitute for the volume of private capital which normally should be invested in the plant and equipment of industry.

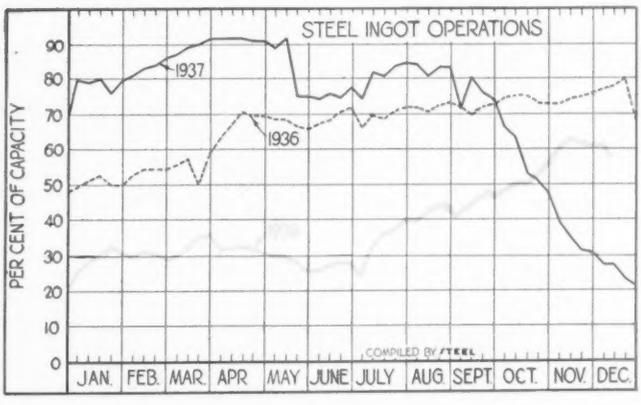
The important question today is with what success this improvement which we have experienced in recent months, resulting primarily from the federal pump-priming, can be integrated into our economic system and thus be made the basis of a recovery movement of a more stable and permanent character.

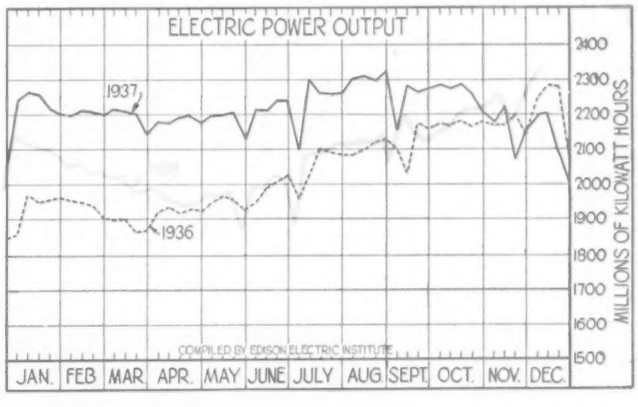
STEEL'S INDEX OF ACTIVITY
IN IRON, STEEL AND METALWORKING INDUSTRIES
BASED UPON FREIGHT CAR LOADINGS, ELECTRIC POWER OUTPUT, AUTOMOBILE ASSEMBLIES (WARD'S REPORTS) AND STEELWORKS OPERATING RATE (STEEL.) AVERAGE FOR 1926 EQUALS 100 WEIGHTED AS FOLLOWS: STEEL RATE 40 AND CARLOADINGS, POWER OUTPUT AND AUTO ASSEMBLIES EACH 20
NO ADJUSTMENTS MADE FOR SEASONAL OR OTHER TRENDS
PER CENT
1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939
1938
1939

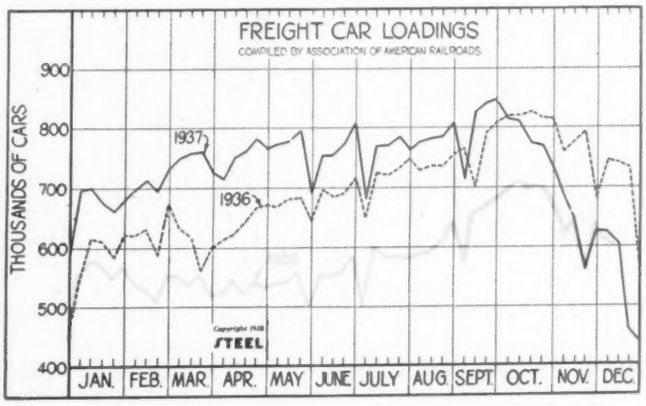
	STEEL'S Index of Activity Index No.	Steelworks Operating Rate Per Cent	Weekly Automobile Output 1000 Units	Electric Power Output Million KWH	Freight Car Loadings 1000 Cars
1929					
Jan.	104.1	83	97.5	1,682	893
Feb.	111.2	85	116.2	1,718	942
Mar.	114.8	94	117.5	1,692	962
Apr.	122.5	98	139.7	1,692	996
May	122.9	96	138.5	1,699	1,051
June	120.3	95	123.2	1,686	1,052
July	115.2	95	112.7	1,689	1,038
Aug.	116.9	92	112.3	1,740	1,117
Sept.	110.8	85	97.7	1,763	1,135
Oct.	107.1	82	81.0	1,812	1,169
Nov.	92.2	74	50.1	1,789	978
Dec.	78.3	58	27.9	1,786	835
Ave.	109.5	86	101.2	1,729	1,014
1930					
Jan.	87.6	67	55.1	1,789	837
Feb.	99.2	79	79.4	1,777	876
Mar.	98.6	76	85.5	1,735	883
Apr.	101.7	76	96.3	1,720	912
May	101.2	74	97.7	1,697	914
June	95.8	67	87.6	1,692	930
July	79.9	55	50.1	1,643	895
Aug.	85.4	57	63.2	1,685	938
Sept.	83.7	58	52.6	1,698	931
Oct.	78.8	53	37.7	1,728	950
Nov.	71.0	42	37.4	1,715	798
Dec.	64.3	33	34.6	1,720	680
Ave.	87.3	62	64.8	1,717	879
1931					
Jan.	69.1	43	39.7	1,685	719
Feb.	75.5	51	51.4	1,669	709
Mar.	80.4	55	61.0	1,683	735

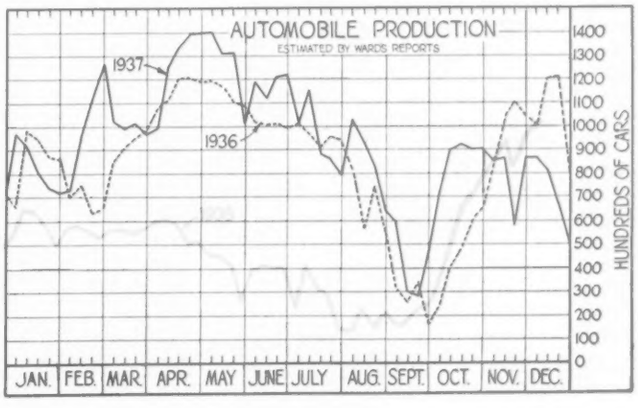
	STEEL'S Index of Activity Index No.	Steel-works Operat-ing Rate Per Cent	Weekly Automo-bile Output 1000 Units	Electric Power Output Million KWH	Freight Car Loadings 1000 Cars
Apr.	81.0	50	73.9	1,660	752
May	78.6	44	75.7	1,636	740
June	72.1	36	63.8	1,614	748
July	67.3	30	60.5	1,626	738
Aug.	67.4	32	50.8	1,639	747
Sept.	64.2	31	41.0	1,635	737
Oct.	59.2	28	21.1	1,650	759
Nov.	54.4	30	8.5	1,627	655
Dec.	51.3	24	11.9	1,646	555
Ave.	68.5	38	46.6	1,648	716
1932					
Jan.	54.6	26	27.8	1,586	567
Feb.	55.3	26	29.2	1,556	561
Mar.	54.2	25	31.5	1,527	565
Apr.	52.8	23	33.8	1,469	557
May	54.6	24	43.8	1,431	522
June	51.4	18	44.1	1,424	491
July	47.1	15	31.1	1,417	483
Aug.	45.0	15	21.1	1,425	525
Sept.	46.5	15	20.9	1,463	577
Oct.	48.4	19	12.6	1,515	634
Nov.	47.5	20	13.9	1,526	549
Dec.	46.2	14	23.5	1,512	485
Ave.	50.3	20	27.8	1,488	543
1933					
Jan.	48.6	17	31.8	1,477	478
Feb.	48.2	18	28.0	1,456	489
Mar.	44.5	14	26.2	1,399	467
Apr.	52.4	22	42.5	1,414	503
May	63.5	38	53.1	1,470	527
June	70.3	49	54.3	1,544	598
July	77.1	56	59.8	1,631	617
Aug.	74.1	52	52.9	1,639	634
Sept.	68.0	41	45.9	1,634	634
Oct.	63.1	36	38.0	1,621	651
Nov.	52.8	26	15.3	1,606	572
Dec.	54.0	33	14.3	1,601	518
Ave	59.7	34	38.5	1,541	557

	STEEL'S Index of Activity Index No.	Steel-works Operat-ing Rate Per Cent	Weekly Automo-bile Output 1000 Units	Electric Power Output Million KWH	Freight Car Loadings 1000 Cars
1934					
Jan.	58.8	32	32.4	1,611	548
Feb.	73.9	41	64.2	1,644	587
Mar.	78.9	49	78.3	1,656	614
Apr.	83.6	53	93.0	1,650	584
May	83.7	58	80.3	1,645	610
June	80.6	59	69.2	1,652	616
July	63.7	28	55.6	1,638	587
Aug.	63.0	24	55.6	1,659	613
Sept.	56.9	21	38.0	1,621	624
Oct.	56.4	25	24.3	1,665	629
Nov.	54.9	28	15.9	1,685	557
Dec.	58.9	36	25.2	1,726	526
Ave.	67.6	38	52.7	1,654	591
1935					
Jan.	74.2	48	59.5	1,750	554
Feb.	82.0	53	79.2	1,754	583
Mar.	83.1	49	94.2	1,725	602
Apr.	85.0	45	109.6	1,700	576
May	81.8	45	96.7	1,699	578
June	77.4	39	84.8	1,728	617
July	75.3	40	77.3	1,763	565
Aug.	76.7	50	54.7	1,825	626
Sept.	69.7	52	19.0	1,822	658
Oct.	77.0	52	40.7	1,872	713
Nov.	88.1	54	87.4	1,916	625
Dec.	88.2	51	91.7	1,950	580
Ave.	79.9	48	74.6	1,792	606
1936					
Jan.	85.9	51	86.8	1,820	595
Feb.	84.3	56	71.7	1,942	623
Mar.	88.7	55	92.2	1,880	605
Apr.	100.8	70	115.4	1,922	643
May	101.8	68	114.6	1,943	670
June	100.3	69	100.7	1,995	697
July	100.1	69	96.7	2,039	715
Aug.	97.1	72	72.4	2,103	738
Sept.	86.7	72	26.9	2,114	776
Oct.	94.8	74	47.5	2,170	819




ELECTRIC POWER OUTPUT
MILLIONS OF KILOWATT HOURS
1937
1936
COMPILED BY EDISON ELECTRIC INSTITUTE
JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.



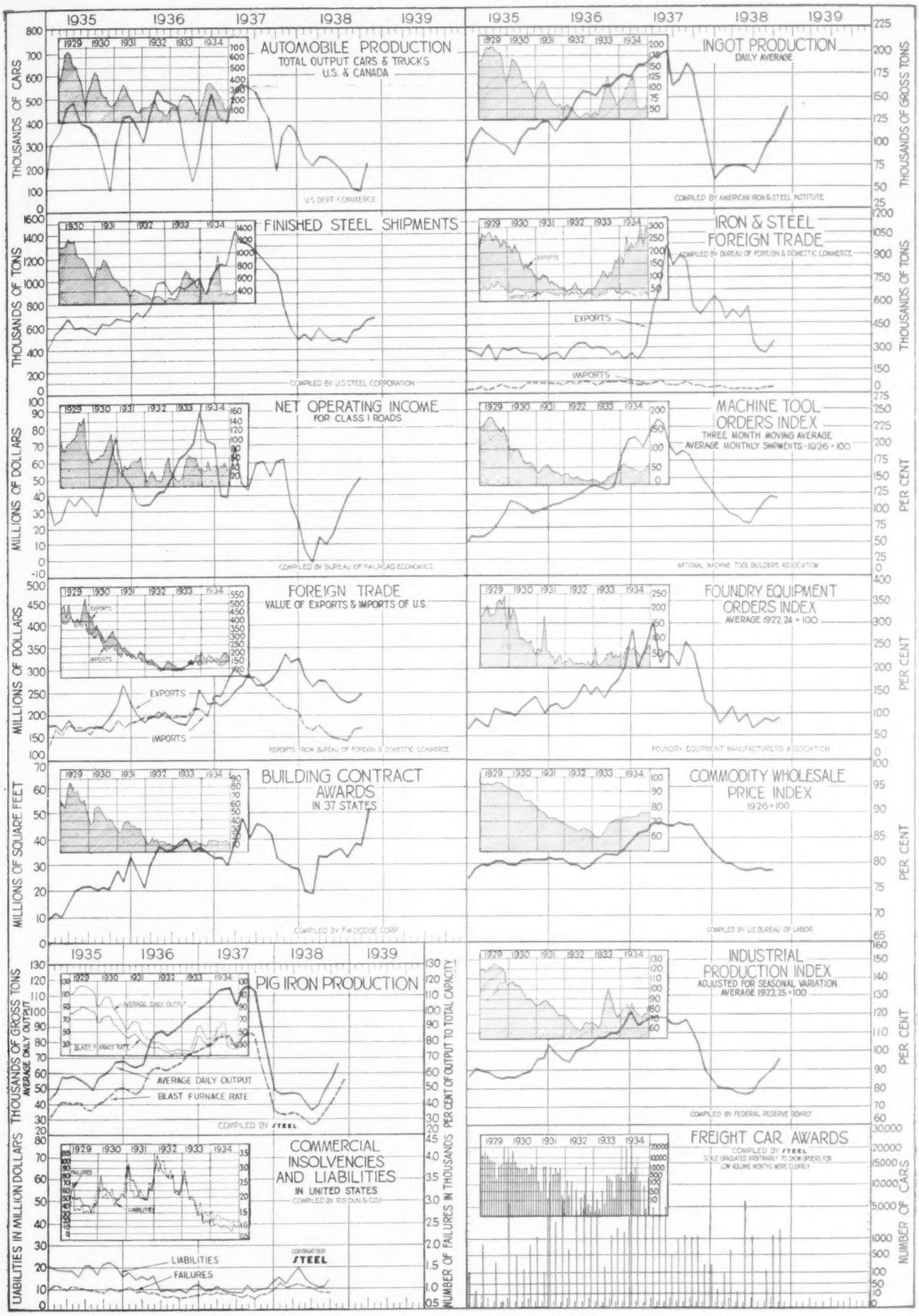


	STEEL'S Index of Activity Index No.	Steelworks Operating Rate Per Cent	Weekly Automobile Output 1000 Units	Electric Power Output Million KWH	Freight Car Loadings 1000 Cars
Nov.	106.4	74	100.7	2,167	753
Dec.	107.6	75	104.9	2,219	673
Ave.	96.2	67	85.9	2,026	692
1937					
Jan.	102.9	79	83.2	2,210	663
Feb.	106.8	82	88.2	2,204	695
Mar.	114.4	88	107.1	2,206	750
Apr.	116.6	92	113.7	2,171	739
May	121.7	87	136.6	2,194	779
June	109.9	75	114.5	2,199	744
July	110.4	80	102.7	2,229	762
Aug.	110.0	83	89.6	2,290	779
Sept.	96.8	78	45.3	2,255	796
Oct.	98.1	61	77.9	2,274	803
Nov.	84.1	38	79.9	2,167	657
Dec.	74.7	27	80.4	2,159	577
Ave.	104.1	72	93.3	2,213	729
1938					
Week ending:					
Jan. 1	62.7	21.0	49.5	1,998	457
Jan. 8	70.1	26.0	54.1	2,139	552
Jan. 15	74.4	29.0	65.7	2,115	581
Jan. 22	74.7	30.5	65.4	2,109	570
Jan. 29	73.8	33.0	59.4	2,099	543
Ave.	71.1	27.9	58.8	2,092	543
Feb. 5	70.9	31.0	51.4	2,082	565
Feb. 12	71.2	30.0	57.8	2,052	543
Feb. 19	71.9	31.0	59.1	2,059	536
Feb. 26	70.3	30.5	57.0	2,031	512
Ave.	71.1	30.6	56.3	2,056	539
Mar. 5	70.1	29.5	54.4	2,036	553
Mar. 12	70.8	30.0	57.4	2,015	557
Mar. 19	71.3	32.0	57.5	2,018	540
Mar. 26	72.4	35.0	56.8	1,975	573
Ave.	71.1	31.6	56.5	2,011	556
Apr. 2	72.0	36.0	57.5	1,979	523
Apr. 9	71.3	32.0	70.0	1,990	522
Apr. 16	71.4	32.0	62.0	1,958	538
Apr. 23	70.8	32.5	60.5	1,951	524
Apr. 30	68.4	32.0	50.7	1,939	543
Ave.	70.8	32.9	60.1	1,963	530
May 7	68.5	31.0	53.4	1,939	536
May 14	67.2	30.0	47.4	1,968	542
May 21	67.1	30.0	46.8	1,968	546
May 28	66.5	28.5	45.1	1,973	562
Ave.	67.3	29.9	48.2	1,962	546
June 4	58.1	25.5	27.0	1,879	503
June 11	64.4	25.5	40.1	1,992	554
June 18	65.2	27.0	41.8	1,991	556
June 25	66.0	28.0	40.9	2,019	559
Ave.	63.4	26.5	37.4	1,970	543
July 2	66.5	28.0	40.9	2,015	589
July 9	57.1	24.0	25.4	1,881	501
July 16	69.9	32.0	42.0	2,084	602
July 23	68.7	36.0	32.0	2,085	581
July 30	69.0	37.0	30.4	2,094	589
Ave.	66.2	31.4	34.1	2,032	572
Aug. 6	66.9	40.0	14.8	2,116	584
Aug. 13	66.9	40.0	13.8	2,134	590
Aug. 20	70.5	41.5	23.9	2,139	598
Aug. 27	70.3	43.5	18.7	2,134	621
Ave.	68.6	41.2	17.8	2,131	598
Sept. 3	72.3	44.5	22.1	2,149	648
Sept. 10	66.8	41.5	17.5	2,048	569
Sept. 17	72.9	46.0	16.1	2,215	660
Sept. 24	74.0	48.0	20.4	2,154	676
Ave.	71.5	45.0	19.0	2,141	638
Oct. 1	74.9	47.0	25.4	2,139	698
Oct. 8	78.9	48.5	37.7	2,154	703
Oct. 15	84.3	51.5	50.5	2,183	727
Oct. 22	88.7	51.5	68.3	2,214	706
Oct. 29	91.4	54.5	73.3	2,226	709
Ave.	83.6	50.6	51.0	2,183	709
Nov. 5	93.4	57.5	80.0	2,207	673
Nov. 12	95.9	61.5	86.3	2,209	637
Nov. 19	100.4	63.0	96.7	2,270	657
Nov. 26	93.9	62.0	84.9	2,183	562
Ave.	95.9	61.0	87.0	2,217	632
Dec. 3	100.1	61.0	97.8	2,285	649
Dec. 10	100.7	61.0	100.7	2,318	619
Dec. 17	99.8*	58.0	102.9	2,332	603*
Dec. 24	....	....	....	.....	...
Dec. 31	....	....	....	.....	...

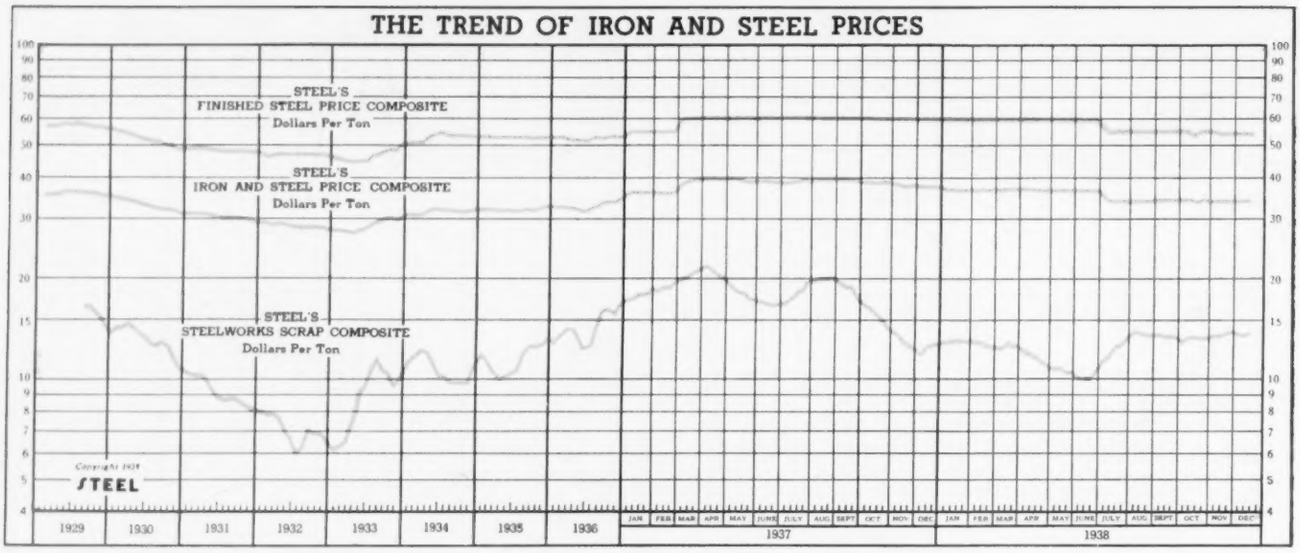
*Preliminary.

	Bureau of Labor's Wholesale Commodity Price Index	Auto Output 1000 Cars	Building Awards Million Sq. Ft.	Railroad Earnings Million Dollars	Exports of Iron and Steel 1000 Tons	Shipments Finished Steel U. S. S. 1000 Tons	Imports of Iron and Steel 1000 Tons	Foreign Trade Exports Million Dollars	Foreign Trade Imports Million Dollars	Index Industrial Production Per Cent	Blast Furnace Production Rate Per Cent	Index of Foundry Equip. Orders Per Cent	Index of Machine Tool Orders Per Cent	R. R. Freight Car Orders 1000 Cars
1929														
Jan.	95.9	422	58	76	274.3	....	54.7	488	369	119	79.0	180.5	158.4	12.45
Feb.	95.4	498	54	83	259.7	....	58.1	442	369	118	82.2	197.0	166.8	14.39
Mar.	96.1	626	78	96	270.9	....	52.7	490	384	118	85.5	209.4	177.9	11.07
Apr.	95.5	664	85	93	277.6	....	54.3	425	411	121	87.4	172.6	183.0	6.98
May	94.7	636	81	101	261.5	....	74.3	385	400	122	89.8	177.7	182.7	8.36
June	95.2	567	72	103	247.8	....	63.6	393	353	125	88.5	177.3	174.8	5.87
July	96.5	518	75	122	270.5	....	71.4	403	353	124	87.2	219.3	163.5	0.24
Aug.	96.3	512	67	139	242.9	....	83.9	381	369	121	86.4	229.5	156.8	2.56
Sept.	96.1	430	60	132	222.4	....	60.9	437	351	121	83.3	216.3	147.4	4.26
Oct.	95.1	395	66	151	247.6	....	63.2	529	391	118	82.6	245.3	159.2	17.21
Nov.	93.5	227	51	85	241.8	....	54.0	442	339	110	75.8	128.6	137.1	5.13
Dec.	93.3	125	44	71	215.2	....	47.8	427	310	103	65.5	208.0	123.2	9.79
Ave.	95.3	468	66	104	252.7		61.6	437	367	118	82.8	196.8	160.9	8.19
1930														
Jan.	92.5	284	33	55	225.1	1,104	43.6	411	311	106	65.0	160.1	97.3	6.63

(*Continued on Page 228*)


AUTOMOBILE PRODUCTION
TOTAL OUTPUT CARS & TRUCKS U.S. & CANADA
U.S. DEPT. COMMERCE
INGOT PRODUCTION
DAILY AVERAGE
COMPILED BY AMERICAN IRON & STEEL INSTITUTE
FINISHED STEEL SHIPMENTS
COMPILED BY U.S. STEEL CORPORATION
IRON & STEEL FOREIGN TRADE
COMPILED BY BUREAU OF FOREIGN & DOMESTIC COMMERCE
EXPORTS
IMPORTS
NET OPERATING INCOME
FOR CLASS I ROADS
COMPILED BY BUREAU OF RAILROAD ECONOMICS
MACHINE TOOL ORDERS INDEX
THREE MONTH MOVING AVERAGE
AVERAGE MONTHLY SHIPMENTS - 1926 = 100
NATIONAL MACHINE TOOL BUILDERS ASSOCIATION
FOREIGN TRADE
VALUE OF EXPORTS & IMPORTS OF U.S.
REPORTS FROM BUREAU OF FOREIGN & DOMESTIC COMMERCE
FOUNDRY EQUIPMENT ORDERS INDEX
AVERAGE 1922-24 = 100
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION
BUILDING CONTRACT AWARDS
IN 37 STATES
COMPILED BY F.W. DODGE CORP.
COMMODITY WHOLESALE PRICE INDEX
1926 = 100
COMPILED BY U.S. BUREAU OF LABOR
PIG IRON PRODUCTION
AVERAGE DAILY OUTPUT
BLAST FURNACE RATE
COMPILED BY STEEL
INDUSTRIAL PRODUCTION INDEX
ADJUSTED FOR SEASONAL VARIATION
AVERAGE 1923-25 = 100
COMPILED BY FEDERAL RESERVE BOARD
COMMERCIAL INSOLVENCIES AND LIABILITIES
IN UNITED STATES
COMPILED BY R.G. DUN & CO.
LIABILITIES
FAILURES
COPYRIGHT 1939 STEEL
FREIGHT CAR AWARDS
COMPILED BY STEEL
SCALE GRADUATED ARBITRARILY TO SHOW ORDERS FOR LOW VOLUME MONTHS MORE CLEARLY
THOUSANDS OF CARS
THOUSANDS OF TONS
MILLIONS OF DOLLARS
MILLIONS OF SQUARE FEET
THOUSANDS OF GROSS TONS
AVERAGE DAILY OUTPUT
LIABILITIES IN MILLION DOLLARS
NUMBER OF FAILURES IN THOUSANDS
PER CENT OF OUTPUT TO TOTAL CAPACITY
PER CENT
NUMBER OF CARS

THE TREND OF IRON AND STEEL PRICES

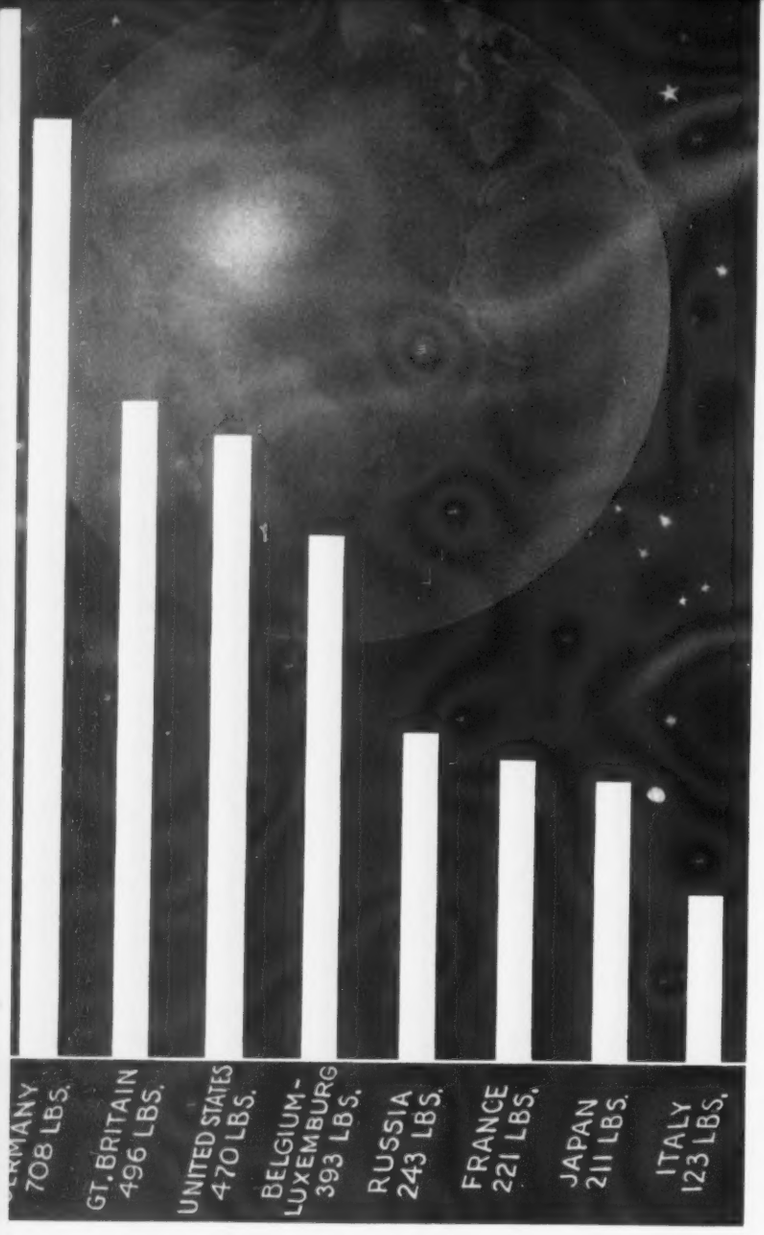


(*Continued from Page 226*)

	Bureau of Labor's Wholesale Commodity Price Index	Auto Output 1000 Cars	Building Awards Million Sq. Ft.	Railroad Earnings Million Dollars	Exports of Iron and Steel 1000 Tons	Shipments Finished Steel U. S. S. 1000 Tons	Imports of Iron and Steel 1000 Tons	Foreign Trade Exports Million Dollars	Foreign Trade Imports Million Dollars	Index Industrial Production Per Cent	Blast Furnace Production Rate Per Cent	Index of Foundry Equip. Orders Per Cent	Index of Machine Tool Orders Per Cent	R. R. Freight Car Orders 1000 Cars
Feb.	91.4	346	38	58	197.2	1,142	43.3	349	282	107	72.1	196.4	95.7	15.93
Mar.	90.2	417	54	60	238.3	1,240	56.6	370	301	103	74.5	164.1	98.6	4.46
Apr.	90.0	468	57	61	208.6	1,189	53.7	332	308	104	75.4	122.8	98.1	1.54
May	88.8	445	54	68	196.1	1,204	54.3	320	285	102	74.2	92.7	91.6	1.08
June	86.8	350	48	68	159.4	985	48.9	295	250	98	69.3	102.1	81.3	0.79
July	84.4	276	45	81	131.8	947	39.1	267	221	93	60.3	90.6	65.1	1.31
Aug.	84.3	234	40	94	151.2	947	35.4	298	218	90	57.8	85.2	61.1	0.82
Sept.	84.4	229	41	103	131.2	867	40.2	312	226	90	53.8	91.0	63.0	0.57
Oct.	83.0	159	39	111	131.9	785	38.3	327	247	88	49.6	50.0	62.8	3.29
Nov.	81.3	142	33	61	112.0	676	43.1	289	204	86	44.1	45.3	53.0	2.86
Dec.	79.6	161	29	49	102.0	579	40.7	275	209	84	38.1	59.8	40.6	2.69
Ave. ..	86.4	293	43	72	165.4	972	44.7	320	255	96	61.2	105.1	75.7	3.50
1931														
Jan.	78.2	178	25	34	92.7	800	40.7	250	183	83	38.4	65.3	36.3	0.00
Feb.	76.8	230	28	27	91.2	762	28.0	224	175	86	42.5	54.7	40.6	0.02
Mar.	76.0	289	38	46	109.3	907	40.4	236	210	87	45.4	174.4	49.6	2.17
Apr.	74.8	354	39	39	101.4	879	47.8	215	186	88	46.5	57.7	56.6	2.77
May	73.2	330	39	41	95.0	764	37.1	204	180	87	44.7	54.1	57.3	0.05
June	72.1	258	34	50	75.6	653	37.8	187	174	83	37.9	40.9	49.2	0.97
July	72.0	223	34	56	84.5	594	37.2	181	175	82	32.7	38.7	41.1	0.44
Aug.	72.1	192	31	55	73.3	573	30.1	165	167	78	28.7	16.9	38.2	0.53
Sept.	71.2	143	30	54	69.8	487	30.9	180	170	76	27.0	31.9	35.0	0.00
Oct.	70.3	82	31	63	59.3	476	27.4	205	169	73	26.3	45.9	31.9	0.80
Nov.	70.2	70	21	36	59.6	436	34.6	194	150	73	15.5	17.2	28.0	0.03
Dec.	68.6	124	17	27	57.3	351	25.8	184	154	74	22.0	26.3	30.1	0.01
Ave. ..	73.0	206	31	44	80.8	640	34.9	202	174	81	34.0	52.0	41.2	0.65
1932														
Jan.	67.3	123	13	11	40.7	426	31.0	150	136	72	22.1	20.5	32.8	0.16
Feb.	66.3	123	12	22	40.5	413	26.7	154	131	69	23.4	32.9	30.4	0.01
Mar.	66.0	127	17	33	49.9	389	41.0	155	131	67	22.0	27.9	23.9	0.11
Apr.	65.5	155	14	20	58.1	395	35.9	135	126	63	20.2	13.9	20.6	0.00
May	64.4	192	16	12	80.5	338	39.7	132	112	60	17.9	18.5	20.8	0.03
June	63.9	190	12	12	52.1	325	34.5	114	110	59	14.7	14.2	21.7	0.05
July	64.5	117	14	11	52.6	272	18.0	107	79	58	13.0	18.7	18.7	0.03
Aug.	65.2	94	14	28	33.0	292	23.6	109	91	60	12.0	18.6	16.8	0.02
Sept.	65.3	86	14	49	36.0	316	29.2	132	98	66	14.0	11.9	15.3	1.29
Oct.	64.4	52	11	63	41.2	310	33.7	153	106	67	14.7	23.2	15.7	0.00
Nov.	63.9	62	12	33	56.0	276	34.9	139	105	65	14.7	13.8	16.4	0.00
Dec.	62.6	109	7	32	54.1	228	29.3	132	97	66	12.5	18.6	17.6	0.05
Ave. ..	64.9	119	13	27	49.6	332	31.4	134	110	64	16.8	19.4	20.9	0.15
1933														
Jan.	61.0	132	8	14	56.7	285	21.8	121	96	65	13.3	68.4	18.3	0.00
Feb.	59.8	109	7	10	63.9	276	19.7	101	84	63	14.3	16.1	15.2	0.00
Mar.	60.2	122	10	10	80.6	257	22.1	108	95	59	12.7	9.8	11.1	0.01
Apr.	60.4	185	11	19	100.4	335	28.0	105	88	66	15.1	19.4	8.3	0.05
May	62.7	224	15	41	123.1	455	26.2	114	107	78	20.9	25.6	10.6	0.01
June	65.0	257	16	59	102.6	604	34.3	120	122	91	30.6	45.5	15.5	0.50
July	68.9	236	15	64	88.3	701	52.8	144	143	100	42.2	48.8	22.4	0.07
Aug	69.5	239	13	61	119.4	668	46.8	132	155	91	42.8	56.3	27.9	0.13
Sept.	70.8	198	13	61	108.8	575	55.7	160	147	84	36.4	34.9	30.9	0.02

	Bureau of Labor's Wholesale Commodity Price Index	Auto Output 1000 Cars	Building Awards Million Sq. Ft.	Railroad Earnings Million Dollars	Exports of Iron and Steel 1000 Tons	Shipments Finished Steel U. S. S. 1000 Tons	Imports of Iron and Steel 1000 Tons	Foreign Trade Exports Million Dollars	Foreign Trade Imports Million Dollars	Index Industrial Production Per Cent	Blast Furnace Production Rate Per Cent	Index of Foundry Equip. Orders Per Cent	Index of Machine Tool Orders Per Cent	R. R. Freight Car Orders 1000 Cars
Oct.	71.2	138	16	57	164.8	573	46.6	193	151	76	31.8	42.5	33.3	0.52
Nov.	71.1	63	12	38	157.6	430	28.9	184	129	72	26.2	36.6	38.0	0.67
Dec.	70.8	84	11	38	184.6	601	31.3	193	134	75	27.9	43.8	51.1	0.01
Ave. ..	66.0	166	12	39	112.5	480	34.5	140	121	77	26.2	37.3	23.5	0.17
1934														
Jan.	72.2	163	10	31	178.0	332	22.6	172	136	78	28.8	37.2	56.5	0.15
Feb.	73.6	239	8	29	151.2	385	25.4	163	133	81	32.5	65.8	58.2	19.72
Mar.	73.7	353	15	52	261.3	588	38.4	191	158	84	37.5	75.4	50.9	0.52
Apr.	73.3	371	14	32	201.5	643	26.8	179	147	78	41.4	67.9	48.5	0.75
May	73.7	351	15	39	241.8	745	29.4	160	155	86	47.5	66.5	46.8	0.52
June	74.6	320	15	42	219.4	985	24.8	171	136	78	46.3	70.4	42.6	1.22
July	74.8	276	13	35	233.2	370	17.6	162	127	75	28.4	50.7	38.6	0.00
Aug.	76.4	245	14	40	242.9	378	32.4	172	120	73	24.5	43.1	37.1	0.11
Sept.	77.6	176	13	41	301.3	370	23.8	191	132	71	21.5	46.4	37.4	0.00
Oct.	76.5	136	15	49	220.2	344	20.2	205	130	73	22.1	55.3	40.5	0.08
Nov.	76.5	85	13	33	209.3	366	35.2	195	151	74	22.8	80.4	44.2	0.00
Dec.	76.9	156	9	39	282.7	419	69.7	171	132	86	23.7	66.9	54.1	0.36
Ave. ..	75.0	239	13	39	228.6	494	30.5	178	138	78	31.4	60.5	46.3	1.95
1935														
Jan.	78.8	300	11	21	262.7	534	22.7	176	167	91	34.2	76.6	61.3	0.02
Feb.	79.5	350	10	26	228.5	583	28.9	163	153	89	41.4	75.7	61.5	0.81
Mar.	79.4	448	16	38	323.0	668	21.4	185	177	88	41.0	69.4	60.3	0.00
Apr.	80.1	477	20	35	205.3	592	28.8	164	171	91	40.0	113.2	60.3	0.60
May	80.2	382	22	40	286.6	599	47.7	165	171	85	40.2	100.7	67.1	0.00
June	79.8	372	23	34	289.7	578	33.2	170	157	91	37.2	100.2	76.7	5.15
July	79.4	345	22	37	296.8	548	31.9	173	178	86	35.2	94.0	94.7	0.50
Aug.	80.5	245	22	42	247.3	625	31.3	172	169	87	40.7	113.0	112.2	0.10
Sept.	80.7	93	21	57	244.4	615	53.1	198	162	89	42.5	128.5	108.5	0.11
Oct.	80.5	280	28	75	238.4	687	59.5	221	189	95	45.8	140.0	102.9	0.81
Nov.	80.6	409	24	54	205.2	682	56.6	269	169	98	49.5	100.4	93.8	0.03
Dec.	80.9	418	33	46	239.3	661	53.7	223	187	104	49.0	118.1	89.9	10.03
Ave. ..	80.0	343	21	41	255.6	614	39.1	190	171	91	41.4	102.5	82.4	1.51
1936														
Jan.	80.6	377	27	36	241.6	721	50.4	199	187	98	48.2	127.0	102.6	2.05
Feb.	80.6	301	21	34	213.8	676	43.5	182	193	94	46.6	110.4	107.1	6.90
Mar.	79.6	439	31	35	264.3	784	56.7	195	199	93	48.5	115.0	109.4	0.63
Apr.	79.7	528	37	41	301.9	980	49.2	193	203	98	59.1	134.0	114.4	4.42
May	78.6	481	36	42	314.9	984	59.4	201	191	101	63.1	165.4	116.6	8.90
June	79.2	470	37	50	294.9	886	59.9	185	192	103	63.6	141.4	124.5	5.20
July	80.5	451	39	62	296.7	951	47.5	178	193	107	61.5	159.5	132.6	7.22
Aug.	81.6	276	40	65	295.3	924	60.7	178	195	108	64.3	144.8	135.5	0.22
Sept.	81.6	140	35	70	235.8	962	59.9	221	216	109	66.9	161.0	132.0	1.75
Oct.	81.5	230	37	90	261.9	1,007	64.5	265	212	109	71.0	173.8	127.5	2.21
Nov.	82.4	406	35	72	203.3	883	61.9	226	196	114	72.3	200.4	134.0	1.55
Dec.	84.2	519	34	71	244.2	1,067	52.6	230	244	121	74.2	283.3	180.4	23.45
Ave. ..	80.8	385	34	56	264.6	902	55.5	205	202	105	61.6	159.7	126.4	5.38
1937														
Jan.	85.9	400	33	39	201.7	1,150	43.0	222	240	115	76.6	190.9	201.7	17.80
Feb.	86.3	384	30	39	290.9	1,134	41.6	233	278	116	79.5	249.5	207.7	4.97
Mar.	87.8	519	42	70	570.6	1,414	51.8	257	307	118	82.5	294.2	192.4	8.15
Apr.	88.0	553	48	48	683.7	1,344	68.1	269	287	118	83.7	208.3	219.8	9.77
May	87.4	540	40	44	969.2	1,304	49.0	289	285	118	84.3	242.0	234.2	4.73
June	87.2	521	46	59	826.5	1,269	44.7	265	286	114	76.6	228.2	227.6	0.54
July	87.9	451	46	61	889.4	1,187	47.0	267	265	114	82.9	204.0	190.5	1.03
Aug.	87.5	405	41	51	886.4	1,108	61.4	278	246	117	85.7	257.5	180.9	1.47
Sept.	87.4	176	32	60	543.7	1,048	37.0	297	233	111	83.7	231.8	187.2	1.21
Oct.	85.4	338	30	61	522.6	792	37.2	333	224	102	68.4	185.2	180.8	1.35
Nov.	83.3	377	29	32	556.6	587	27.0	315	223	88	49.3	128.0	163.5	0.27
Dec.	81.7	347	28	26	626.4	487	25.8	323	209	84	35.6	111.2	140.8	0.22
Ave. ..	86.3	418	37	49	630.6	1,069	44.5	279	257	110	74.1	210.9	194.0	4.30
1938														
Jan.	80.9	227	19	7	586.3	518	29.6	289	171	80	33.6	76.8	129.6	0.02
Feb.	79.8	203	19	2*	460.6	475	19.6	263	163	79	33.6	90.4	112.3	0.10
Mar.	79.7	239	34	14	526.9	572	11.8	276	173	79	34.2	114.6	100.4	0.68
Apr.	78.7	238	33	9	489.2	502	21.2	274	160	77	33.4	79.3	91.0	0.01
May	78.1	210	35	16	540.6	465	20.8	257	148	76	29.4	90.6	88.0	6.01
June	78.3	189	36	25	312.0	478	15.9	233	146	77	25.5	61.2	75.7	1.18
July	78.8	150	33	38	263.7	442	14.7	228	141	83	28.2	74.2	75.5	0.00
Aug.	78.1	97	38	45	242.1	559	20.0	231	165	88	34.8	83.3	93.6	0.01
Sept.	78.3	90	37	50	346.1	578	28.0	246	168	90	40.5	78.7	109.3	1.75
Oct.	77.6	215	51	69	425.4	663	26.3	228	178	96	48.0	87.9	118.8	2.54
Nov.	...	...	..	..	....	680	...	...	...	..	55.0	89.7	115.9	1.23
Dec.	...	...	..	..	....	...	...	...	...	..	...	...	....	...

*Deficit.



■ **Germany led in per capita steel consumption in 1938, with Great Britain second—a reflection of demands for armament. United States, long the leader, was third**

World Steel Output Drops 19.5 Per Cent; American Proportion Recedes

BY VINCENT DELPORT,
European Manager, STEEL

■ LACK of trade more than impending war preparations caused the sharp drop in world iron and steel production that occurred in 1938, but lack of trade was due mainly to the absence of confidence brought about by the growing menace of war in Europe, and by political and social disturbances in such countries as France and the United States. As a result of frontier modification between Germany, Czechoslovakia and Poland, and of the absorption of Austria by Germany, considerable changes took place in the productive capacity of those countries.

STEEL's estimate of world production of steel ingots and castings in 1938 is 107,523,000 gross tons, against 133,616,000 tons in 1937, a decrease of 19.5 per cent.

For pig iron and ferroalloys, the estimated output for 1938 is 80,802,000 gross tons, compared with 102,046,000 tons in 1937, a decrease of 20.8 per cent. Production of both steel and pig iron was lower than in 1936, but higher than in any intervening year between 1936 and 1929.

The decline in American production, in relation to that of any other country, is the largest of all. For steel it amounts to 43.5 per cent in comparison with the 1937 output; for pig iron, 47.5 per cent. As a result, the share of the United States in world steel production, which was 38.6 per cent in 1937, dropped last year to 27.1 per cent; as regards pig iron, the United States produced 24.2 per cent of the world's total, against 35.4 per cent in 1937.

In 1938, the nations of Europe produced 68,510,000 tons of steel, or 4.8 per cent less than in 1937, and 53,925,000 tons of pig iron, a decrease of 6.3 per cent. In 1938, the tonnage of pig iron produced in the world was 75.2 per cent of the total steel output. In 1937, the proportion was 76.5 per cent; in 1936, 73.3.

Following the accession of Austria to Germany, this latter country is now by far the largest producer in Europe, and insofar as the year 1938 was concerned, the German output of pig iron nearly equaled that of the United States. Even excluding the output of the Austrian furnaces, Germany made a considerable advance, both as regards pig iron and steel production, and once again exceeded all her prior records. Russia, now the next highest producing nation in Europe, again recorded a higher output, but it is noticeable that the rate of increase last year was much smaller than in former years.

Some changes have taken place in the ranking of other European countries as producers—some of a permanent nature, due to territorial modifications, others due to the vagaries of trade and politics.

As regards steel output, Great Britain comes an easy third, with over 10,000,000 tons. Well behind is France, with barely 6,000,000 tons, followed by Italy, Belgium, Czechoslovakia, Poland and Luxemburg, all of which countries produced more than 1,000,000 tons. Czechoslovakia was still ahead of Poland, but, owing to the loss of the Trinec works, it is to be expected that, as from 1939, Poland will take precedence.

In pig iron, Great Britain again ranks after Germany and Russia, being followed by France, Belgium, Luxemburg and Czechoslovakia.

Outside the United States and Europe there was

not much difference in the iron and steel output of the principal producing nations as between 1938 and 1937, the trend, with the possible exception of Japan, being more toward a decrease than an increase.

The table of exports and imports of the countries leading in foreign trade shows a marked decrease in exchanges of iron and steel, amounting to 31.5 per cent in the case of exports from those countries. The reduction of exports was particularly marked as regards Belgium and Luxemburg, and the United States. Germany was the only one of the countries referred to that showed an increase of imports.

Per capita steel consumption is figured on production, plus imports, minus exports, divided by population.

On this basis, Germany was the leading per capita consumer with 708 pounds, compared with 548 pounds in 1937. Great Britain was second with 496 pounds, compared with 548 in 1937.

United States, the leader in 1937 with per capita consumption of 844 pounds, was third in 1938 with 470 pounds.

In fourth place was Belgium-Luxemburg with 393 pounds per capita. Russia was fifth with 243 pounds, France sixth with 221 pounds, Japan seventh with 211 pounds and Italy eighth with 123 pounds.

World Production of Steel Ingots and Castings

Gross Tons

	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
United States ...	29,183,000	51,526,000	48,525,000	34,467,000	26,502,000	23,232,000	13,681,000	25,945,000	40,699,000	56,433,000
Canada	1,160,000	1,352,000	1,078,000	915,000	741,000	403,000	335,000	671,400	1,009,000	1,391,000
Great Britain....	10,500,000	12,984,000	11,785,000	9,859,000	8,850,000	7,024,000	5,261,000	5,203,000	7,326,000	9,636,000
France	5,845,000	7,793,000	6,601,000	6,177,000	6,075,000	6,427,000	5,550,000	7,697,000	9,296,000	9,544,000
Belgium	2,210,000	3,807,000	3,117,000	2,975,000	2,901,000	2,687,000	2,745,000	3,073,000	3,300,000	4,066,000
Luxemburg	1,385,000	2,470,000	1,949,000	1,808,000	1,901,000	1,815,000	1,925,000	2,002,000	2,234,000	2,659,000
Italy	2,330,000	2,054,000	1,992,000	2,174,000	1,820,000	1,755,000	1,369,000	1,430,000	1,746,000	2,109,000
Spain	300,000	100 000	365,000	555,000	635,000	498,000	525,000	594,000	910,000	985,000
Sweden	950,000	1,088,000	962,000	882,000	848,000	620,000	520,000	530,000	601,000	683,000
Germany*	22,900,000	19,531,000	18,900,000	16,184,000	11,725,000	7,690,000	5,678,000	8,136,000	11,354,000	15,986,000
Austria†	90,000	640,000	411,000	358,000	304,000	222,000	201,000	317,000	461,000	622,000
Czechia§	1,800 000	2,254,000	1,463,000	1,135,000	938,000	749,000	662,000	1,490,000	1,721,000	2,103,000
Poland§	1,550,000	1,433,000	1,123,000	930,000	831,000	805,000	542,000	1,020,000	1,217,000	1,355,000
Hungary	650,000	654,000	543,000	439,000	310,000	224,000	177,000	311,000	363,000	505,000
Russia	18,000,000	17,535,000	16,080 000	12,320,000	9,412.000	6,790,000	5,900,000	5,333,000	5,610,000	4,828,000
Japan	6,000,000	5,700,000	5,174,000	4,858,000	3,682,000	3,150,000	2,300,000	1,834,000	2,288,000	2,249,000
India	900,000	895,000	866,000	862,000	798,000	694,000	570,000	625,000	619,000	575,000
Australia	870,000	900,000	750,000	697,000	518,000	393,000	221,000	360,000	420,000	460,000
Saar††	.	.	.	.	1,919,000	1,649,000	1,440,000	1,513,000	1,904,000	2,174,000
Miscellaneous ...	900,000	900,000	800,000	750,000	450,000	350,000	300,000	350,000	400,000	400,000
World total...	107,523,000	133,616,000	122,484,000	98,345,000	81,160,000	67,177.000	49,902,000	68,434,000	93,478,000	118,763,000

*Includes Austrian production since March 15, 1938. †Up to March 15; from that date, Austrian production included in German figures. Estimated output for the year—675,000 tons. §Owing to the annexation of the Teschen district by Poland, Czech production was diminished and Polish production was augmented by the output of the Trinec works as from October, 1938, approximately 100,000 tons. ††Included in Germany since 1934.

World Production of Pig Iron and Ferroalloys

Gross Tons

	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
United States ...	19,507,000	37,127,000	31,029,000	21,373,000	16,139,000	13,346,000	8,781,000	18,426,000	31,752,000	42,614,000
Canada	760,000	979,000	747,000	655.000	438,000	258,000	160,000	466,000	813,000	1,160,000
Great Britain ...	6,800,000	8,493,000	7,721,000	6,424,000	5,969,000	4,136,000	3,574 000	3,773,000	6,192,000	7,589,000
France	5,800,000	7,787,000	6,130,000	5,696,000	6,053,000	6,223,000	5,448,000	8,068,000	9,874 000	10,198,000
Belgium	2,380,000	3,782,000	3,110,000	2,982,000	2,860,000	2,667,000	2,705,000	3,180,000	3,311,000	4,030,000
Luxemburg	1,600,000	2,472 000	1,955,000	1,842,000	1,968,000	1,858,000	1,929,000	2,020,000	2,433,000	2,860,000
Italy	940,000	849,000	793,000	683,000	564,000	544,000	481,000	532 000	569,000	718,000
Spain	250,000	110,000	250,000	350,000	365,000	334,000	296 000	468,000	606,000	740,000
Sweden	645,000	682,000	623,000	603,000	550,000	341,000	277,000	411,000	488,000	516,000
Germany*	18,200,000	15,703,000	15,058 000	12,637,000	8,602,000	5,183,000	3,870,000	5,964,000	9,540 000	13,187,000
Austria†	50,000	383,000	244,000	190 000	132,000	87,000	93,000	143,000	282,000	455,000
Czechia§	1,250,000	1,648,000	1,122,000	798,000	591,000	491,000	443,000	1,146,000	1,414,000	1,618,000
Poland§	965,000	712 000	575,000	388,000	376,000	301,000	196,000	341,000	470,000	693,000
Hungary	345,000	352,000	301,000	183,000	138,000	92,000	65,000	157 000	253,000	362,000
Russia	14,700,000	14,288,000	14,088,000	12,411,000	10,273 000	7,085,000	6,101,000	4,782,000	4,920,000	4,253,000
Japan	3,000.000	3,000,000	2,823 000	2,739,000	2,400,000	2,019,000	1,525,000	1,385,000	1,635,000	1,491,000
India	1,700,000	1,629,000	1,543,000	1,466,000	1,331.000	1,065.000	914,000	1,079,000	1,180 000	1,343,000
Australia	710,000	850,000	783,000	698,000	487,000	336,000	190,000	380,000	308,000	420,000
Saar††	.	.	.	.	1,797,000	1,567,000	1,327,000	1,491,000	1,881 000	2,071,000
Miscellaneous ...	1,200 000	1,200,000	1,000,000	800,000	700 000	600,000	700,000	800,000	750,000	750,000
World total.	80,802,000	102,046,000	89,895,000	72,918,000	61,733,000	48,533,000	39,075,000	55,005,000	78,671,000	97,073,000

*Includes Austrian production since March 15, 1938. †Up to March 15; from that date, Austrian production included in German figures. Estimated output for the year—525,000 tons. §Owing to the annexation of the Teschen district by Poland, Czech production was diminished and Polish production was augmented by the output of the Trinec works as from October, 1938, approximately 75,000 tons. ††Included in Germany since 1934.

Iron, Steel Exports and Imports of Principal Countries

(Gross tons—Scrap eliminated)

	EXPORTS					IMPORTS				
	1938	1937	1936	1935	1913	1938	1937	1936	1935	1913
United States	2,100,000	3,472,000	1,233,000	1,020,000	2,648,000	240,000	452,000	528,000	405,000	273,000
Great Britain	1 900,000	2,576,000	2,203,000	2,372,000	4,969,000	1,350 000	2,039,000	1,483,000	1,152,000	2,331,000
Germany	2,680,000	3,604,000	3,550,000	3,089,000	6,200,000*	655,000	532,000	508,000	635,000	300,000*
France	1 810,000	2,133,000	1,575,000	1,842,000	640,000	95,000	170,000	173,000	170,000	185,000
Belgium and Luxemburg..	2,300,000	3,947,000	3,190,000	3,129,000	1,550,000†	200,000	428,000	423,000	297,000	874,000†
Total	10,790,000	15,732,000	11,751,000	11,452,000	16,007,000	2,540,000	3,621,000	3,115,000	2,659,000	3,963,000

*Includes Luxemburg. †Belgium only.

The Rules Have Changed . . . .
But Business Marches On

(*Concluded from Page* 136)

ficulty of determining a minimum price level at which a manufacturer is willing to invoke the law.

Steel producers have made relatively little use of this law. This because of the fact competition is too widespread on many standard, branded products.

The social security act has much in its objectives to recommend it. But again, as in the case of many other pieces of social legislation, the question of approach has been of vital concern, and now as the law enters its fourth year it is not surprising that there is considerable criticism of its operation. The law, it is charged, is failing in its main objectives, while imposing a heavy burden on management and employes.

Recent recommendations by the social security advisory council, comprised of 25 economists and industrial leaders—including E. R. Stettinius Jr. and Gerard Swope—embody constructive observations.

Urge Government Participation

The most salient proposals: Direct government participation in the contribution of funds for old age pensions, with this participation eventually to amount to the sharing of one-third the cost; direct crediting of taxes under the law to old age insurance funds and not to funds of the general treasury for later annual appropriation, in whole or in part, as congress may see fit; start of payment of insurance benefits in 1940, instead of 1942; and extension of benefits to include seamen and employes of private nonprofit religious, charitable and educational institutions, and later to include farm laborers and domestic employes, with a study also proposed for including the self-employed.

The council also proposed average old age benefits payable in the early years be increased, as the worker covered late in his employable life would not be able to build an adequate annuity credit for himself; that benefits to married men be supplemented by 50 per cent where there is an aged wife; and that annuities be paid to widows and orphans of insured persons.

The council warned, however, that "we should not commit future generations to a burden larger than we would want to bear ourselves" and suggested as one means of compensating for the increased costs, which would be made necessary by broadening the scope of the act, that there be a contraction eventually of the rates of benefit payment to individuals as single annuitants. The council also proposed that there be no increase in the rate beyond the 1½ per cent, which becomes effective in 1940, without further study.

How is the act working? Theoretically it should absorb or materially reduce the general relief burden, but this has not been the experience to date.

Further, it is pointed out, it has contributed to the still large unemployment list, not only by layoffs where taxes have proved too formidable, but, indirectly and importantly, by a reduction in purchasing power. For instance, every contribution being made to old age insurance by 40,000,000 or more at present is reducing purchasing power by just that much. And these payments are being used to help finance the federal deficit!

The apparent necessity for the government to use these payments for such purpose indicates it will have to revise its fiscal policies before it will be able to furnish much financial aid. This year, despite use of the old age contributions, the federal deficit will run close to four billion dollars, making for a 9-year deficit of more than 24 billion.

All this adds weight to the council's admonition "no benefits should be promised or implied, which cannot be safely financed." Apparently there is a minority opinion on the council which holds the eventual cost of the proposed revision in old age benefits may exceed by at least an additional 2 per cent, if not more, 10 per cent of the payrolls, originally estimated to be the probable eventual cost under the present plan.

In addition to such amount, there will be at least 3 per cent for unemployment insurance, and the cost of disability and health insurance, should it be adopted within the next few years as now proposed. There is no question but what the council's report has brought forth numerous laudable suggestions, but, as the council itself was quick to point out, much remains for further study and consideration.

The main provisions of the securities exchange act of 1934, generally speaking, are regarded as beneficial to investors, although some opinion in the steel industry is that the securities and exchange commission, set up to administer the act, has gone considerably beyond what was originally contemplated. Regulations applying to business corporations are becoming more drastic. Rules in respect to proxies, put into effect a few months ago, are a case in point.

Under these new rules, a proxy statement must be sent to each person solicited, setting forth the identity of the persons soliciting the proxy, the nature of the matters to be voted on, power of the security holder to revoke his proxy, the rights of dissenting stockholders, and expenses of solicitation, including all compensation paid to solicitors. The security holder also must be given the opportunity to direct how his vote shall be cast on each of the items under consideration. Where proxies cover the election of directors, the statement must give certain information as to each person. Where the question is one of the issuance of securities or the alteration of the financial structure, certain financial information must be included.

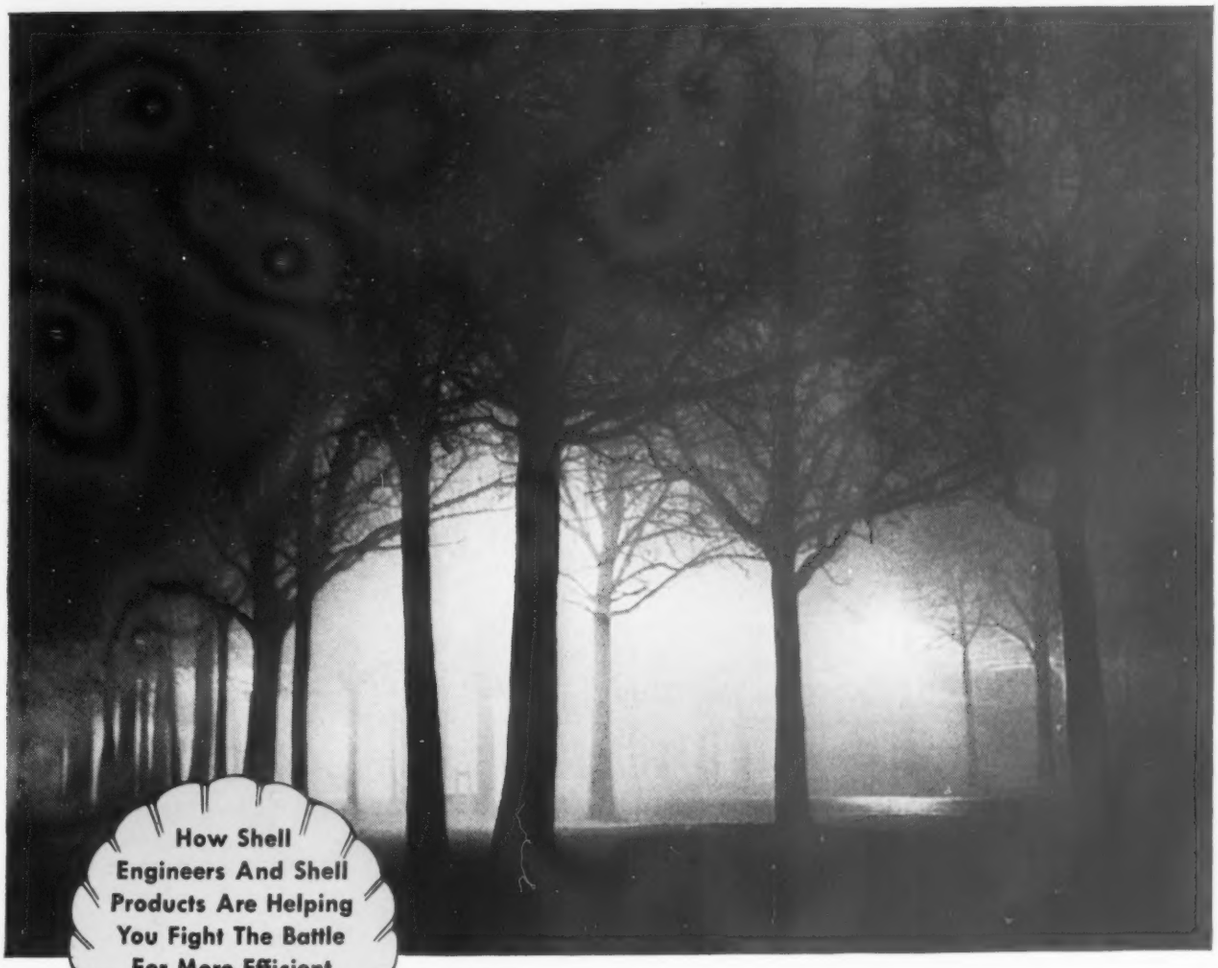
Maritime Contracts Complicated

Some of the more important changes in recent years include the placing of public sale and underwriting of new security issues completely under supervision of SEC; the outlawing of interlocking directorates; abolishing security affiliates of banks, and forbidding of banks of deposit to underwrite issues.

To sellers of ship steel the Vinson act of 1934, with its section 3 and subsequent amendments, has proved a fount of many difficulties. When its provisions, as set forth in the amended section, were extended to the maritime act of 1936 the obstacles were spread from navy work to all ship construction let by the maritime commission.

Profits are limited to 10 per cent of the total cost on all contracts in excess of $10,000. All profits in excess of 10 per cent are payable to the treasury department, which has the authority to determine what these profits are. Around this question, with "profit" an ambiguous term, revolves many complicated rules and interpretations. Contractors and subcontractors are forced to keep elaborate records, and in most instances must wait long after work has been completed for an audit by Washington, to know what their profit and loss record on a job actually is.

DOLLARS-LOST IN A MIST



How Shell Engineers And Shell Products Are Helping You Fight The Battle For More Efficient Industrial Lubrication

EVER hear the story of the little lost dollar—lost in an oily mist? It can be heard in power plants, mills, factories and in the engine rooms of steamships, wherever the mist of steam-cylinder oils of unsuitable grade or inferior quality is wasting dollars instead of saving them. Its message may be translated into terms of excess oil consumption, low engine efficiency, increased maintenance costs—all reflecting reduced profits. You *can* do something about these mist-bound dollars!

For instance—Shell Engineers have developed Shell Wolco Oils—a series of great steam-cylinder lubricants. They are more readily atomized yet highly stable and heat resistant. And they deposit less undesirable residue than most cylinder oils on the market! If you are interested in saving dollars in power—dollars in maintenance—get in touch with your nearest Shell office today. A Shell representative will give you the complete story of this finest of steam-cylinder lubricants.

SHELL WOLCO OILS

Steel Ingot and Pig Iron Production

Steel Ingot Figures by American Iron and Steel Institute. Coke Pig Iron by STEEL

Pig Iron

Gross Tons

	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily
			1931				1932				1933				1934	
Jan.	309	102	1,715,443	55,337	298	61	971,437	31,336	291	45	568,785	18,348	289	86	1,225,643	39,537
Feb.	307	109	1,711,192	61,114	298	64	960,550	33,122	291	44	553,067	19,752	289	90	1,270,792	45,385
March	307	116	2,028,906	65,448	298	60	967,015	31,194	291	38	542,013	17,484	289	97	1,625,588	52,438
April	307	113	2,009,582	66,986	297	59	855,734	28,524	291	48	623,606	20,786	285	109	1,736,217	57,873
May	307	105	1,995,001	64,355	297	54	783,769	25,282	290	61	892,326	28,784	284	117	2,057,471	66,370
June	303	91	1,637,998	54,599	297	47	626,015	20,867	289	90	1,264,953	42,165	283	92	1,936,897	64,563
July	303	82	1,462,270	47,170	297	45	570,222	18,394	289	105	1,801,345	58,108	282	74	1,228,544	39,630
Aug.	303	75	1,279,205	41,264	297	41	528,105	17,035	289	98	1,833,265	59,137	282	61	1,060,187	34,199
Sept.	303	74	1,168,436	38,947	295	46	593,640	19,788	289	89	1,507,931	50,264	282	61	899,075	29,969
Oct.	303	69	1,172,781	37,831	292	50	644,648	20,795	289	81	1,358,540	43,824	282	65	951,353	30,689
Nov.	302	67	1,101,820	36,727	292	51	625,753	20,858	289	77	1,083,740	36,124	281	60	957,906	31,930
Dec.	301	57	980,377	31,625	291	42	547,179	17,650	289	74	1,192,136	38,456	281	67	1,028,006	33,161
Total			18,263,011	*50,035			8,674,067	*23,699			13,221,707	*36,223			15,977,679	*43,774
			1935				1936				1937				1938	
Jan.	281	89	1,478,443	47,692	267	118	2,029,304	65,461	243	169	3,219,741	103,863	236	91	1,444,862	46,608
Feb.	281	96	1,614,905	57,675	266	120	1,838,932	63,411	242	176	3,020,006	107,857	236	91	1,306,333	46,655
March	280	97	1,770,990	57,120	265	126	2,046,121	66,004	242	182	3,470,470	111,951	236	90	1,470,211	47,426
April	278	97	1,671,556	55,719	265	143	2,409,474	80,316	241	186	3,400,636	113,354	236	79	1,388,008	46,267
May	275	96	1,735,577	55,986	253	145	2,659,643	85,795	240	170	3,545,180	114,360	236	73	1,260,937	40,675
June	272	91	1,558,463	51,949	253	144	2,596,528	86,551	240	182	3,115,302	103,843	236	67	1,060.747	35,358
July	270	92	1,520,340	49,043	252	146	2,595,791	83,735	237	192	3,501,359	112,947	236	77	1,213,076	39,131
Aug.	270	98	1,759,782	56,767	248	148	2,711,726	87,475	237	191	3,616,954	116,676	237	88	1,495,514	48,242
Sept.	270	104	1,770,259	59,009	247	154	2,728,257	90,942	237	181	3,417,960	113,932	237	97	1,683,097	56,103
Oct.	269	116	1,978,379	63,818	245	161	2,991,794	96,509	237	151	2,891,026	93,259	237	114	2,067,499	66,694
Nov.	268	122	2,066,293	68,876	245	165	2,949,942	98,331	237	114	2,007,031	66,901	236	121	2,286,661	76,222
Dec.	268	120	2,115,496	68,242	245	170	3,125,192	100,813	237	93	1,503,474	48,499	...	...	.....	.....
Total			21,040,483	*57,694			30,682,704	*83,832			36,709,139	*100,573			†16,676,945	*49,931

*Average †Eleven months.

Steel Ingots

Gross Tons

	†1931 Total	†1931 Daily Av.	†1932 Total	†1932 Daily Av.	†1933 Total	†1933 Daily Av.	†1934 Total	†1934 Daily Av.
January	2,512,140	93,042	1,484,991	57,115	1,016,870	39,110	1,997,129	73,968
February	2,547,027	106,126	1,481,253	59,250	1,073,012	44,709	2,211,944	92,164
March	3,054,339	117,475	1,433,337	53,087	898,236	33,268	2,798,440	103,646
April	2,766,959	106,421	1,259,629	48,447	1,335,422	53,817	2,936,064	117,443
May	2,551,633	98,140	1,125,243	43,279	1,976,428	73,201	3,399,494	125,907
June	2,127,762	81,837	912,757	35,106	2,564,420	98,632	3,059,483	117,672
July	1,887,580	72,599	806,722	32,269	3,168,354	126,734	1,489,453	59,578
August	1,716,829	66,032	846,730	31,360	2,863,569	106.058	1,381,350	51,161
September	1,545,411	59,439	991,858	38,148	3,283,079	87,811	1,268,977	50,759
October	1,590,180	58,896	1,087,508	41,810	2,084,894	80,188	1,481,902	54,885
November	1,591,644	63,666	1,032,221	39,701	1,521,189	58,507	1,610,625	61,947
December	1,301,211	50,047	861,034	33,117	1,798,606	71,944	1,964,257	78,570
Total	25,192,715	*81,006	13,322,833	*42,701	22,594,079	*72,884	25,599,118	*82,312

	†1935 Total	†1935 Daily Av.	†1936 Total	†1936 Wkly. Av.	†1937 Total	†1937 Wkly. Av.	†1938 Total	†1938 Wkly. Av.
January	2,870,161	106,302	3,039,804	686,186	4,718,436	1,065,110	1,732,764	391,143
February	2,774,271	115,595	2,956,891	714,225	4,414,699	1,103,675	1,703,726	425,931
March	2,865,292	110,204	3,333,853	752,563	5,218,326	1,177,952	2,012,406	454,268
April	2,640,602	101,562	3,932,605	914,593	5,070,867	1,182,020	1,925,166	448,757
May	2,633,661	97,543	4,037,375	911,371	5,151,909	1,162,959	1,806,805	407.857
June	2,258,664	90,347	3,975,569	926,706	4,184,723	975,460	1,638,277	381,883
July	2,267,827	87,224	3,914,370	885,604	4,556,304	1,030,838	1,982,058	448,429
August	2,915,930	107,997	4,184,287	944,534	4,877,826	1,101,089	2,546,988	574,941
September	2,825,004	113,000	4,151,388	969,950	4,289.507	1,002,221	2,657,748	620,969
October	3,142,759	116,398	4,534,246	1,023,532	3,392,924	765,897	3,117,934	703,823
November	3,150,409	121,170	4,323,025	1,007,698	2,154,365	502,183	3,572,220	832,685
December	3,073,405	122,936	4,424,367	1,000,988	1,473,021	333,263	.....	.....
Total	33,417,985	*107,453	46,807,780	*895,329	49,502,907	*949,423	‡24,696,092	*517,520

*Average. †The Institute excludes crucible and electric ingots, which totaled 412,489 tons in 1931, 241,756 tons in 1932, 421,884 tons in 1933, 361,827 tons in 1934, 542,134 tons in 1935, 773,271 tons in 1936 and 815,244 tons in 1937. ‡Eleven months.

Statistics of pig iron and steel ingot production for earlier years will be found in STEEL, Jan. 3, 1938, pages 296 and 297.

MELTRITE PIG

MELTRITE

MADE BY THE PEOPLE WHO HAVE *PIONEERED* IN THE MERCHANT FIELD

OLD STYLE PIG

★ So clearly has MELTRITE lowered costs in foundry operations by saving melting time, reducing losses and increasing, as well as improving output that today scores of plants employ only MELTRITE and hundreds of others use more MELTRITE than any other pig iron.

PICKANDS MATHER & CO.

FOUNDED 1883

CLEVELAND • CHICAGO • DETROIT • ERIE • TOLEDO • MINNEAPOLIS • DULUTH • ST. LOUIS

NEW YORK: James C. Alley • PHILADELPHIA: Carson, Marshall & Co.

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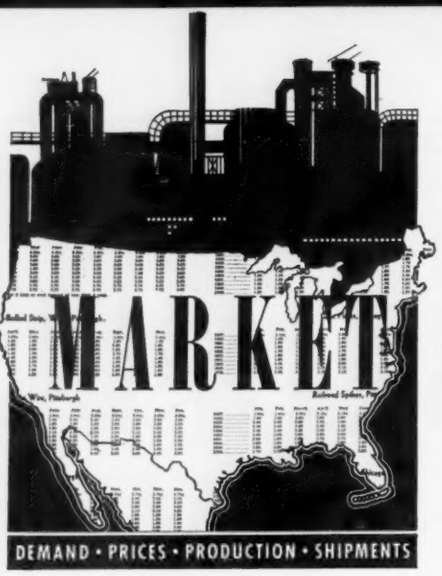


DOMESTIC MARKET SUMMARY

Prices Reduced $3 to $7 During Dull Year; Marketing System Radically Revised

■ STEELMAKERS in 1938 experienced an almost complete reversal from the preceding year. Instead of high production, as during the first three quarters of 1937, with a sudden decline toward the close, business was poor until fourth quarter, with a moderate rise in the final months. The sellers' market prevailing during much of 1937 gave place to a buyers' market through all last year. In contrast to delayed deliveries, at no time were consumers required to wait for steel.

With consumer inventories larger than had been estimated, sellers were faced by dearth of demand, accentuated by buyers' inability to move their finished products against general business stagnation. Until these surplus stocks had been liquidated buying was light. The stalemate lasted for months, finally yielding to improvement in the entire business situation.

At the year's beginning steelworks operated at 21 per cent of capacity as they emerged from the holiday lull. By the end of January they had attained 33 per cent and continued close to this level until early August, when 40 per cent was reached. A gradual rise followed, touching 50 per cent at mid-October and 60 per cent in November. Production held close to that level until the year end. Output was little better than half that of 1937.

Sheet, Strip Quotations Put on New Basis

This contrasts with an operating rate of 80 to 90 per cent for nine months in 1937, with a precipitous fall in the final three months, to 23 per cent at the end. Floods and labor troubles, deterrents in 1937, were absent from the picture last year.

Prices underwent numerous changes and closed the year at $3 to $7 per ton lower on finished steel and $3 on pig iron. Prices applying during most of 1937 continued well into 1938, the first change coming May 18, when Carnegie-Illinois Steel Corp., reaffirming prices for third quarter, made an exception on flat-rolled products. To equalize conditions between hot-rolled strip and hot and cold-rolled sheets new lists of extras and deductions were announced. These resulted from experience with new continuous mills, which had changed the situation as to costs. As the new extras would have brought an increase when applied to second quarter bases these were reduced $2 per ton, with the option of using old base and extras or the new for the remainder of second quarter, whichever gave the lower price. The new schedules became fully effective June 30. After some delay manufacturers of galvanized sheets followed with reduction of $3 per ton for third quarter.

Carnegie-Illinois made further announcement June 24, reducing finished steel base prices $3 to $5 per ton on most products. At the same time the former differential price at Chicago over Pittsburgh was wiped out. Tennessee Coal, Iron & Railroad Co. announced a Birmingham, Ala., base at the same level as Pittsburgh. This made reductions $1 more at Chicago than at Pittsburgh and $3 greater at Birmingham.

New Basing Points Complicate Situation

Abandonment of Chicago and Birmingham differentials caused other producers to establish basing points at numerous producing centers, practically abandoning the pricing system in effect for nearly 15 years. Bethlehem Steel Co. made basing points at Buffalo, Sparrows Point, Md., and Claymont, Del., Youngstown Sheet & Tube Co. at Youngstown, O., and American Rolling Mill Co. at Middletown, O., among others. The effect of these new bases was to disrupt established relations in the steel market, tending to localize selling areas, and later resulted in some profound changes in variety of products by mills which could not meet the new competition.

Pig iron was reduced $4 per ton July 1 by a Chicago furnace, which was followed generally. Effective Sept. 27 this price was raised $1 per ton, which remained in effect through the year.

Tin plate was quoted at $5.35 per base box until Nov. 10, when a reduction of $7 per ton to $5 per base box was made. Later action, at the end of November, by which producers refunded $5 per ton on all business booked between Jan. 1 and Nov. 10, made the actual decline $2 per ton.

At the middle of October an open cut of $4 per ton on sheets and strip followed development of price ir-

Advertisement

COPPER ALLOY BULLETIN

Reporting News and Technical Developments of Copper and Copper-Base Alloys

JANUARY "Bridgeport" BRASS CO. 1939

BRIDGEPORT'S NEW ROLLING MILL IN PRODUCTION

LABORATORIES LOCATED IN NEW QUARTERS

With the beginning of operation at the new rolling mill, Bridgeport's testing and research laboratories have been relocated in enlarged quarters adjacent to the mill. From this convenient location the metallurgists who prepare the specifications that metal must meet retain close supervision of the manufacturing processes. This coordination between laboratory and mill is an important phase of Bridgeport's system of intensive control.

The new laboratory building houses complete facilities for the testing of copper alloys to insure their meeting the requirements of customers' fabricating processes and product applications, and for metallurgical research and development. Included is equipment for the chemical and spectrographic analysis of alloys, for the determination of strength and other physical properties, and for the microscopic examination of surface finish and grain size (degree of anneal).

Exterior view of the new unit that houses the company's laboratories and offices. The building is adjacent to the new mill.

Facilities are also available for complete testing and analysis of incoming raw materials. These include not only the basic metals used in brass manufacture, but also fuels, tool steels, lubricants, and other materials required in factory processes.

In these laboratories takes place the final step in Bridgeport's program of control, where each production run is checked to insure exact conformity with original specifications.

MODERN FACILITIES INSURE HIGHEST QUALITY OF BRASS AND BRONZE THROUGH INTENSIVE CONTROL OF EVERY MANUFACTURING STEP

Production is now under way at Bridgeport Brass Company's new rolling mill, where the latest types of equipment, occupying an area of more than 200,000 square feet, are used for the manufacture of copper alloys in sheet, roll, and strip form.

In the design of the new mill, Bridgeport's 73 years of experience in the art of brass making was supplemented by a thorough study of the most recent developments in non-ferrous as well as ferrous metal processing, both in this country and abroad. Before plans were drawn, Bridgeport engineers and metallurgists made first-hand studies of current rolling mill practice throughout the United States and in England and Continental Europe, analyzing the merits of new processes and equipment, and adapting the most desirable in the light of their own knowledge of the requirements of copper alloy users and fabricators.

Straight-Line System is Flexible

The new mill is the first in the entire brass industry to employ the straight-line principle of production, which has been so successfully used in the manufacture of steel. Equipment is located to give a continuous flow of metal through each processing stage to the finished sheet or roll. At the same time full flexibility of operation is retained, and metal can readily be diverted from the straight-line flow for the special processing often needed in a plant where much of the output is engineered to individual requirements.

Typical of the control exercised over every manufacturing step is the hot breakdown mill for copper and certain of the brass and Duronze* alloys. Here a single operator, at a touch on a lever, releases a red-hot billet from the furnace and sends it on its swift journey back and forth between the rolls, while recording gages constantly keep him informed of its progress.

Four-high rolls in the later stages of the rolling process produce metal of uniform thickness from edge to edge. Since the giant backing rolls support the work rolls, they prevent the "spring" that produces a "crown" or high center when metal is produced on ordinary two-high rolls.

The latest types of annealing furnaces make possible exacting control of time and temperatures of anneals, resulting in material of exceptional uniformity and definite tempers.

These modern rolling mill facilities, the last word in brass manufacture, enable Bridgeport to meet still more accurately the needs of its customers, and to extend and improve its service to the users of copper alloys.

(Continued on Following Page)

An aerial view of Bridgeport's new rolling mill, where sheet, rolls, and strip are produced by a straight-line system in the newest of brass-making equipment.

COPPER ALLOY BULLETIN

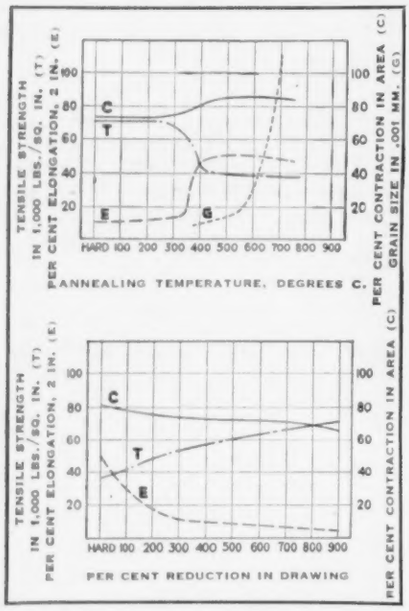
ALLOYS OF COPPER

This is the second of a series of articles on the properties and applications of the copper alloys, and concludes the subject of Commercial Bronze.

COMMERCIAL BRONZE

Commercial Bronze, because of its combination of ductility and strength, sometimes permits several cold working operations with fewer anneals than are needed in forming the same article of High Brass. It is also possible to perform certain operations on Commercial Bronze with a finer grain size than would be needed with High Brass. This fact permits less polishing expense in producing satisfactory finishes.

Commercial Bronze is most commonly used because of its color and its freedom from season cracking. The color of copper-zinc alloys containing about 90% copper varies markedly with only slight changes in the copper content. Many attractive colors can be produced in this range of alloys by varying the copper content or adding small amounts of tin. Commercial Bronze and slight modifications of it are, therefore, extensively used for the manufacture of inexpensive jewelry.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PER CENT ELONGATION, 2 IN. (E)
PER CENT CONTRACTION IN AREA (C)
GRAIN SIZE IN .001 MM. (G)
C
T
E
G
HARD 100 200 300 400 500 600 700 800 900
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PER CENT REDUCTION IN DRAWING

The basic alloys and modifications may be used without risk of deterioration from season cracking or dezincification, both of which may occur in copper-zinc alloys of lower copper content. Modifications of the alloy using small amounts of tin are also useful as a substitute for Phosphor Bronze when color is important or a less expensive alloy is desired. The substitution involves some sacrifice of spring and fatigue characteristics, as compared with Phosphor Bronze. In some cases the greater electrical conductivity of Commercial Bronze is an advantage in clips or springs.

When it is desired to combine the color of Commercial Bronze with free cutting characteristics, about 1% lead is added to the alloy. This entails some sacrifice of ductility, but produces an alloy that is readily machined.

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(Continued from Preceding Page)

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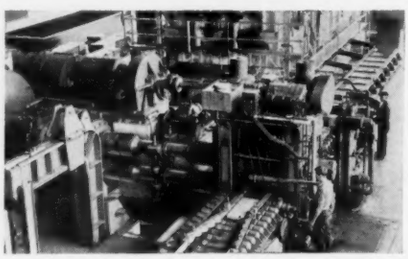

The hot breakdown where billets pass through successive stages of reduction, to attain their specified thickness with extreme precision.

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Flexible welding cable uses a paper separator between copper conductors and rubber insulation to achieve flexibility. Paper acts as a lubricant.

A resistance welder is designed to replace soldering operations on small parts in the assembly of watches, meters, radio sets, and other equipment. Control circuit allows a heavy current to flow for approximately 1/120 second. Various types of terminal units are employed, depending upon the kind of work to be done.

A cut-off machine provides instantaneous metal cutting and mitering. It is made with a swiveling cutting unit so that stock need not be swung through an arc to carry out the mitering operation. It cuts any angle from 45 degrees left to 45 degrees right. Toggle device clamps work securely.

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A comparascope for testing surface finishes can be used on round or flat specimens of any dimensions. It is a portable comparative microscope which is self-illuminating, self-aligning, and self-focusing. A magnified comparison of the work specimen and the standard is shown through a single eye-piece.

An air-turbine grinder is reported to be suitable for exceptionally smooth, rapid grinding and also as an engraving and marking tool on all types of metals. It will operate in any position, and can be mounted in a lathe toolpost for internal grinding.

A high-intensity torch is adapted to all types of general-purpose soldering and brazing. Two tips are available; the smaller for ordinary work, the larger for use when large quantities of alloy must be melted rapidly.

A two-speed polishing lathe can easily be changed over from one speed to another, by transferring belts to a second set of sheaves and adjusting a belt tension nut.

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BRASS "Bridgeport" CO.

Established 1865

COPPER WATER TUBE AND FITTINGS—For plumbing, heating, underground piping.

DURONZE ALLOYS—High-strength silicon bronzes for corrosion-resistant connectors, marine hardware; *hot rolled sheets* for tanks, boilers, heaters, flues, ducts, flashings.

BRASS, BRONZE, DURONZE WIRE—For cap and machine screws, wood screws, rivets, bolts, nuts.

FABRICATING SERVICE DEPT.—Engineering staff, special equipment for making parts or complete items.

BRASS AND COPPER PIPE—"Plumrite"* for plumbing, underground and industrial services.

*Trade-name.

BRIDGEPORT BRASS

regularities, making a total drop of about $7 per ton from the first of the year. This price was withdrawn within a few days and the market stabilized at the previous level. In the interval some large consumers placed considerable business.

Sheets and strip continued to occupy a leading position although tonnage was greatly reduced from the previous year. Comparatively low production of automobiles and reduced sales of household utilities fabricated from flat-rolled steel accounted for much of this. Prices developed weakness early in the year and readjustment was undertaken by new extras and deductions, followed by reduction in base price and elimination of geographical differentials. Hot-rolled sheets were quoted at 2.40c, Pittsburgh, until June, then reduced to 2.15c, Pittsburgh, galvanized taking two cuts of $3 each, from 3.80c to 3.50c, Pittsburgh.

Light Demand Rules in Most Products

Cold-rolled strip fared about the same as sheets, miscellaneous demand furnishing most support. Its price declined from 3.20c for first half to 2.95c, Pittsburgh, for last half. Hot-rolled strip was reduced from 2.40c to 2.15c, Pittsburgh.

Plate demand was light but shipbuilding and various lines of public work furnished some important tonnages. Placing of nearly 50 cargo ships by the maritime commission provided considerable backlog and building of numerous water tanks by municipalities and some heavy plate work for hydroelectric works in the West and South added to this. Virtual absence of freight car buying and pipe line building was felt severely. The price declined from 2.25c to 2.10c, Pittsburgh.

Demand for structural steel held up better than for other products, lettings running parallel with 1937, at a lower level, closing the year with a total almost as great. Public projects were responsible for a large share in bridges, waterworks and similar structures and housing projects in New York contributed substantially. Shape prices started the year at 2.25c and closed at 2.10c, Pittsburgh.

Among largest structural tonnages are the following: Metropolitan Life Insurance Co. housing project, New York, 50,000 tons; Meeker avenue bridge, Brooklyn, N. Y., 17,000; various contracts for Grand Coulee dam, Oregon, 17,000; Delaware aqueduct, New York, 16,750; Narrows bridge, Tacoma, Wash., 15,866; transmission towers, Bonneville dam, Oregon, 15,500; Metropolitan Life Insurance Co. office building, New York, 12,000; sheet piling for United States engineer, Los Angeles, 10,699; government printing office, Washington, 8800; Main avenue bridge, Cleveland, 8175. Numerous other projects requiring 5000 tons or more were placed.

Steel bars, adapted to broader uses than many other steel products, had a fairly good year, limited by reduced automotive and freight car building but receiving support from the agricultural implement industry and miscellaneous users. The price ranged from 2.45c to 2.25c, Pittsburgh.

Wire demand was moderate and prices of both plain wire and nails encountered some irregularity. From 2.90c on wire and 2.75c on nails quotations were lowered to 2.60c and 2.45c, Pittsburgh. Lessened automobile production had considerable effect on wire buying but agricultural demand was fairly good and various other outlets took moderate tonnages.

Pig iron demand was light during most of the year, though it showed revival during the final two months. Production for all purposes showed a slow increase from July, largely a reflection of larger steel production. Foundry consumers became more active late in the year, particularly those engaged in automotive work. Prices were reduced $4 per ton for third quarter and advanced $1 for fourth quarter.

Tin plate experienced a decided contrast to 1937, container demand being much reduced. Backlogs at the beginning of the year supplied needs for a considerable period and expectation of a lower price deferred buying later in the year. Production reached 60 per cent at the height of the canning season but in the final months it was at about 30 per cent.

Scrap prices moved in a narrow range and at comparatively low level. The composite of steelmaking grades compiled by STEEL stood at $13.85 for January, sinking gradually to $10.89 for June, the low point. In July it rose to $13.06 and in August to $14.44, fluctuating between $14 and $15 the remaining months. These prices compare with a range of $17 to $22 in the early part of 1937. Buying was slow during the entire year and consumers maintained ample stocks.

Pipe buying lagged, in common with other products. Steel pipemakers felt lack of pipeline building, only one of importance being in the market, with some small oil-gathering lines. Cast iron pipe experienced an uplift late in the year as a result of federal financing of municipal waterworks. Structural projects were not of a type to require much pipe.

Railroads bought little steel last year, financial conditions preventing expenditures for other than most essential replacements. For several months the carriers hoped for a wage reduction but adverse action by the President's committee, Oct. 29, prevented aid from that direction. Purchases of cars, locomotives and rails were held to a minimum and while some tonnages of plates, shapes, bars and other products for car repairs were placed they were much less than normal.

Exports, Imports in Smaller Volume

An exception to limited buying of freight cars was purchase of 8100 cars by the Southern Railway. Illinois Central entered into a lease-purchase agreement with a builder for 2000 cars. Total placement of cars was the smallest since 1935 and only 20 to 25 per cent of buying in 1936 and 1937. Late in the year a few moderate tonnages of rails were booked for 1939 delivery. Several special streamlined passenger trains were also bought. In 10 months American railroads took delivery on 212 locomotives, compared with 404 in the same period in 1937, 120 being steam-driven, the remainder electric and diesel-electric.

Export trade in 1938 was considerably below the preceding year but was an important factor. For 10 months exports of steel products, excluding scrap, totaled 1,786,624 gross tons, 62 per cent of the 2,867,340 tons exported in the same period of 1937. Scrap exports also declined, falling 31 per cent, from 3,517,508 tons in the first 10 months, 1937, to 2,406,392 tons in the same period last year. Japan accounted for 1,058,065 tons, United Kingdom for 389,712 tons and Italy for 308,890 tons. The European scrap cartel placed several large tonnages. Ten months steel imports were 194,974 tons, compared with 402,431 tons in the corresponding months of 1937, exclusive of scrap.

With steel production far below that of 1937 iron ore from Lake Superior mines totaled only 19,263,011 tons, compared with 62,598,836 tons in 1938, a decline of 69.23 per cent. This was the smallest ore movement since 1932, when it was 3,567,985 tons.

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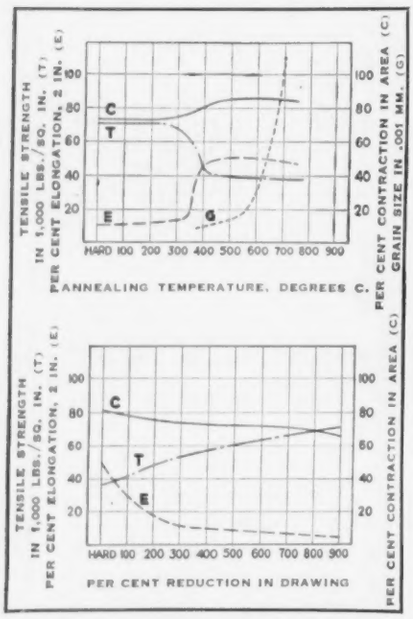
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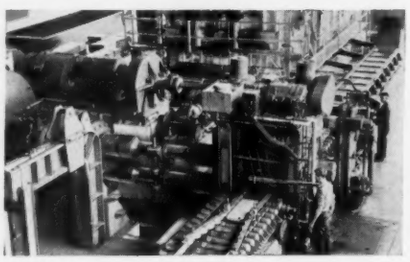

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BRASS, BRONZE, DURONZE WIRE—For cap and machine screws, wood screws, rivets, bolts, nuts.

FABRICATING SERVICE DEPT.—Engineering staff, special equipment for making parts or complete items.

BRASS AND COPPER PIPE—"Plumrite"* for plumbing, underground and industrial services.

BRIDGEPORT BRASS

regularities, making a total drop of about $7 per ton from the first of the year. This price was withdrawn within a few days and the market stabilized at the previous level. In the interval some large consumers placed considerable business.

Sheets and strip continued to occupy a leading position although tonnage was greatly reduced from the previous year. Comparatively low production of automobiles and reduced sales of household utilities fabricated from flat-rolled steel accounted for much of this. Prices developed weakness early in the year and readjustment was undertaken by new extras and deductions, followed by reduction in base price and elimination of geographical differentials. Hot-rolled sheets were quoted at 2.40c, Pittsburgh, until June, then reduced to 2.15c, Pittsburgh, galvanized taking two cuts of $3 each, from 3.80c to 3.50c, Pittsburgh.

Light Demand Rules in Most Products

Cold-rolled strip fared about the same as sheets, miscellaneous demand furnishing most support. Its price declined from 3.20c for first half to 2.95c, Pittsburgh, for last half. Hot-rolled strip was reduced from 2.40c to 2.15c, Pittsburgh.

Plate demand was light but shipbuilding and various lines of public work furnished some important tonnages. Placing of nearly 50 cargo ships by the maritime commission provided considerable backlog and building of numerous water tanks by municipalities and some heavy plate work for hydroelectric works in the West and South added to this. Virtual absence of freight car buying and pipe line building was felt severely. The price declined from 2.25c to 2.10c, Pittsburgh.

Demand for structural steel held up better than for other products, lettings running parallel with 1937, at a lower level, closing the year with a total almost as great. Public projects were responsible for a large share in bridges, waterworks and similar structures and housing projects in New York contributed substantially. Shape prices started the year at 2.25c and closed at 2.10c, Pittsburgh.

Among largest structural tonnages are the following: Metropolitan Life Insurance Co. housing project, New York, 50,000 tons; Meeker avenue bridge, Brooklyn, N. Y., 17,000; various contracts for Grand Coulee dam, Oregon, 17,000; Delaware aqueduct, New York, 16,750; Narrows bridge, Tacoma, Wash., 15,866; transmission towers, Bonneville dam, Oregon, 15,500; Metropolitan Life Insurance Co. office building, New York, 12,000; sheet piling for United States engineer, Los Angeles, 10,699; government printing office, Washington, 8800; Main avenue bridge, Cleveland, 8175. Numerous other projects requiring 5000 tons or more were placed.

Steel bars, adapted to broader uses than many other steel products, had a fairly good year, limited by reduced automotive and freight car building but receiving support from the agricultural implement industry and miscellaneous users. The price ranged from 2.45c to 2.25c, Pittsburgh.

Wire demand was moderate and prices of both plain wire and nails encountered some irregularity. From 2.90c on wire and 2.75c on nails quotations were lowered to 2.60c and 2.45c, Pittsburgh. Lessened automobile production had considerable effect on wire buying but agricultural demand was fairly good and various other outlets took moderate tonnages.

Pig iron demand was light during most of the year, though it showed revival during the final two months. Production for all purposes showed a slow increase from July, largely a reflection of larger steel production. Foundry consumers became more active late in the year, particularly those engaged in automotive work. Prices were reduced $4 per ton for third quarter and advanced $1 for fourth quarter.

Tin plate experienced a decided contrast to 1937, container demand being much reduced. Backlogs at the beginning of the year supplied needs for a considerable period and expectation of a lower price deferred buying later in the year. Production reached 60 per cent at the height of the canning season but in the final months it was at about 30 per cent.

Scrap prices moved in a narrow range and at comparatively low level. The composite of steelmaking grades compiled by STEEL stood at $13.85 for January, sinking gradually to $10.89 for June, the low point. In July it rose to $13.06 and in August to $14.44, fluctuating between $14 and $15 the remaining months. These prices compare with a range of $17 to $22 in the early part of 1937. Buying was slow during the entire year and consumers maintained ample stocks.

Pipe buying lagged, in common with other products. Steel pipemakers felt lack of pipeline building, only one of importance being in the market, with some small oil-gathering lines. Cast iron pipe experienced an uplift late in the year as a result of federal financing of municipal waterworks. Structural projects were not of a type to require much pipe.

Railroads bought little steel last year, financial conditions preventing expenditures for other than most essential replacements. For several months the carriers hoped for a wage reduction but adverse action by the President's committee, Oct. 29, prevented aid from that direction. Purchases of cars, locomotives and rails were held to a minimum and while some tonnages of plates, shapes, bars and other products for car repairs were placed they were much less than normal.

Exports, Imports in Smaller Volume

An exception to limited buying of freight cars was purchase of 8100 cars by the Southern Railway. Illinois Central entered into a lease-purchase agreement with a builder for 2000 cars. Total placement of cars was the smallest since 1935 and only 20 to 25 per cent of buying in 1936 and 1937. Late in the year a few moderate tonnages of rails were booked for 1939 delivery. Several special streamlined passenger trains were also bought. In 10 months American railroads took delivery on 212 locomotives, compared with 404 in the same period in 1937, 120 being steam-driven, the remainder electric and diesel-electric.

Export trade in 1938 was considerably below the preceding year but was an important factor. For 10 months exports of steel products, excluding scrap, totaled 1,786,624 gross tons, 62 per cent of the 2,867,340 tons exported in the same period of 1937. Scrap exports also declined, falling 31 per cent, from 3,517,508 tons in the first 10 months, 1937, to 2,406,392 tons in the same period last year. Japan accounted for 1,058,065 tons, United Kingdom for 389,712 tons and Italy for 308,890 tons. The European scrap cartel placed several large tonnages. Ten months steel imports were 194,974 tons, compared with 402,431 tons in the corresponding months of 1937, exclusive of scrap.

With steel production far below that of 1937 iron ore from Lake Superior mines totaled only 19,263,011 tons, compared with 62,598,836 tons in 1938, a decline of 69.23 per cent. This was the smallest ore movement since 1932, when it was 3,567,985 tons.

Average Monthly Quotations in 1938

Base or Furnace, Unless Otherwise Specified; Scrap, Delivered to Consumers

PITTSBURGH

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Structural Shapes	2.25c	2.25c	2.25c	2.25c	2.25c	2.25c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c
Plates	2.25	2.25	2.25	2.25	2.25	2.25	2.10	2.10	2.10	2.10	2.10	2.10
Bars	2.45	2.45	2.45	2.45	2.45	2.45	2.25	2.25	2.25	2.25	2.25	2.25
Cold-Finished Steel Bars	2.90	2.90	2.90	2.90	2.90	2.90	2.70	2.70	2.70	2.70	2.70	2.70
Strip, Hot-Rolled	2.40	2.40	2.40	2.40	2.40	2.40	2.15	2.15	2.15	2.10	2.10	2.10
Strip, Cold-Rolled	3.20	3.20	3.20	3.20	3.20	3.10	2.95	2.95	2.95	2.90	2.90	2.90
Standard Spikes	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.10	3.00	3.00	3.00
Plain Wire	2.90	2.90	2.90	2.90	2.90	2.90	2.60	2.60	2.60	2.60	2.60	2.60
Structural Rivets	3.60	3.60	3.60	3.60	3.60	3.60	3.40	3.40	3.40	3.40	3.40	3.40
No. 24 Hot-Rolled Annealed Sheets*	3.15	3.15	3.15	3.15	3.15	3.15	....	....	....	....	....	....
No. 9-10 Blue Annealed Sheets*	2.40	2.40	2.40	2.40	2.40	2.40	....	....	....	....	....	....
Hot Rolled Sheets	....	....	....	....	....	....	2.15	2.15	2.15	2.10	2.15	2.15
No. 24 Galvanized Sheets	3.80	3.80	3.80	3.80	3.80	3.75	3.50	3.50	3.50	3.50	3.50	3.50
Tin Plate, base box	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.10†	5.00
Wire Nails	2.75	2.75	2.75	2.75	2.75	2.75	2.45	2.45	2.45	2.45	2.45	2.45
Steel Pipe, 1 to 3-inch, % discount (base $200 per ton)	64½%	64½%	64½%	64½%	64½%	64½%	68½%	68½%	68½%	68½%	68½%	68½%
Bessemer Pig Iron, Neville Island base	$24.50	$24.50	$24.50	$24.50	$24.50	$24.50	$20.50	$20.50	$20.50	$21.50	$21.50	$21.50
Basic Pig Iron, Neville Island base	23.50	23.50	23.50	23.50	23.50	23.50	19.50	19.50	19.50	20.50	20.50	20.50
No. 2 Foundry Pig Iron, Neville Island Base	24.00	24.00	24.00	24.00	24.00	24.00	20.00	20.00	20.00	21.00	21.00	21.00
Malleabie Pig Iron, Neville Island base	24.00	24.00	24.00	24.00	24.00	24.00	20.00	20.00	20.00	21.00	21.00	21.00
Bessemer Ferrosilicon, 10 per cent (Jackson co. base)	33.00	33.00	33.00	33.00	33.00	33.00	29.00	29.00	29.00	30.00	30.00	30.00
Billets, Bessemer and Open-Hearth	37.00	37.00	37.00	37.00	37.00	37.00	34.00	34.00	34.00	34.00	34.00	34.00
Sheet Bars, Bessemer and Open-Hearth	37.00	37.00	37.00	37.00	37.00	37.00	34.00	34.00	34.00	34.00	34.00	34.00
Wire Rods	47.00	47.00	47.00	47.00	47.00	47.00	43.00	43.00	43.00	43.00	43.00	43.00
Furnace Coke, spot	4.25	4.25	4.25	4.25	4.25	3.90	3.75	3.75	3.75	3.75	3.75	3.75
Foundry Coke, spot	5.25	5.25	5.25	5.25	5.25	5.05	5.00	5.00	5.00	5.00	5.00	5.00
Heavy Melting Steel Scrap	14.05	14.15	13.65	12.70	11.55	11.40	13.75	15.20	15.25	14.95	14.85	15.75
Low Phosphorus Scrap	18.10	17.65	17.50	16.90	16.50	15.25	16.50	17.00	17.00	17.00	17.65	18.75
No. 1 Cast Scrap	16.00	16.00	15.75	14.90	13.80	12.75	14.15	15.00	15.00	15.00	15.40	15.75

*Changed to Hot Rolled Sheet base June 24. †Refund of 25 cents on all contracts Jan. 1 to Nov. 10.

CHICAGO

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bars	2.50c	2.50c	2.50c	2.50c	2.50c	2.40c	2.25c	2.25c	2.25c	2.25c	2.25c	2.25c
Plates	2.30	2.30	2.30	2.30	2.30	2.25	2.10	2.10	2.10	2.10	2.10	2.10
Structural Shapes	2.30	2.30	2.30	2.30	2.30	2.25	2.10	2.10	2.10	2.10	2.10	2.10
Rail Steel Bars	2.35	2.35	2.35	2.35	2.35	2.35	2.15	2.10	2.10	2.10	2.10	2.10
Bar Iron	2.35	2.35	2.35	2.35	2.35	2.35	2.15	2.15	2.15	2.15	2.15	2.15
Cold Rolled Sheets	3.25	3.25	3.25	3.25	3.25	3.20	3.20	3.20	3.20	3.15	3.20	3.20
No. 2 Foundry and Malleable Pig Iron	$24.00	$24.00	$24.00	$24.00	$24.00	$24.00	$20.00	$20.00	$20.00	$21.00	$21.00	$21.00
Southern No. 2 Pig Iron, delivered	24.42	24.42	24.42	24.22	24.22	24.22	20.22	20.22	20.22	21.22	21.22	21.22
Lake Superior Charcoal Iron, delivered, Chicago	30.24	30.24	30.24	30.34	30.34	30.34	28.34	28.34	28.34	28.34	28.34	28.34
Heavy Melting Steel Scrap	13.25	12.15	12.20	11.45	11.05	10.25	12.05	14.00	13.60	13.05	14.20	14.25
Steel Specialties, Chicago	15.75	14.85	14.25	13.75	13.60	13.50	14.95	16.75	16.60	15.55	16.10	16.25
Rails for Rolling	14.90	15.25	15.25	15.25	14.85	14.90	17.05	18.25	17.75	16.25	17.40	17.75
Car Wheels, Iron	15.25	14.85	14.10	13.25	12.60	11.75	13.20	14.75	14.60	12.85	14.00	14.25
No. 1 Machinery Cast Scrap	12.75	12.10	11.75	11.45	10.85	10.25	11.40	13.25	13.25	12.00	12.50	12.25

EASTERN PENNSYLVANIA

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tank Plates, delivered Philadelphia	2.44½c	2.44½c	2.44½c	2.44½c	2.44½c	2.371c	2.15c	2.15c	2.15c	2.15c	2.15c	2.15c
Structural Shapes, delivered Philadelphia	2.46½	2.46½	2.46½	2.46½	2.46½	2.40¼	2.21½	2.21½	2.21½	2.21½	2.21½	2.21½
Bars, delivered Philadelphia	2.75	2.75	2.75	2.76½	2.77	2.47	2.57	2.57	2.57	2.57	2.57	2.57
Bar Iron, common, delivered Philadelphia	2.65	2.65	2.65	2.66½	2.67	2.67	2.47	2.47	2.47	2.47	2.47	2.47
Hot Rolled Sheets, delivered Philadelphia	2.70	2.70	2.70	2.716	2.72	2.62	2.32	2.32	2.32	2.28	2.32	2.32
Basic Pig Iron, delivered	$25.34	$25.34	$25.34	$25.34	$25.34	$25.34	$21.34	$21.34	$21.34	$22.34	$22.34	$22.34
No. 2X Foundry Pig Iron, delivered Philadelphia	26.21½	26.21½	26.21½	26.21½	26.21½	26.21½	22.21½	22.21½	22.21½	23.21½	23.21½	23.21½
Standard Low Phosphorus Pig Iron, delivered	29.63	29.63	29.63	29.70	29.74	29.74	26.74	26.74	26.74	27.74	27.74	27.74
No. 1 Heavy Melting Steel Scrap	14.95	14.75	14.44	13.45	12.25	11.85	13.725	14.50	14.25	14.65	14.75	14.75
No. 1 Railroad Wrought Scrap	15.75	15.75	15.75	14.75	13.75	13.75	14.45	15.12½	15.25	15.25	15.25	15.25
No. 1 Cupola Cast Scrap	16.25	16.19	15.75	15.30	14.75	14.75	15.85	16.75	16.75	16.75	16.75	16.75

COAL TAR PRODUCTS

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Benzol, per gallon producers' plants, tank lots	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c	16.00c
Toluol, per gallon producers' plants, tank lots	30.00	30.00	30.00	30.00	26.80	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Solvent naphtha, per gallon producers' plants, tank lots	30.00	30.00	30.00	30.00	28.40	26.00	26.00	26.00	26.00	26.00	26.00	26.00
Xylol, per gallon producers plants, tank lots	30.00	30.00	30.00	30.00	28.40	26.00	26.00	26.00	26.00	26.00	26.00	26.00
Naphthalene, flakes and balls, per pound producers' plants	7.25	7.25	7.25	6.75	6.75	6.75	6.75	6.75	5.75	5.75	5.75	5.75
Phenol, per pound producers' plants in 200-lb. drums	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.25
Sulphate of ammonia, per ton bulk F.o.b. Atlantic seaboard	$29.375	$29.50	$29.50	$29.50	$29.50	$29.50	$28.75	$26.75	$27.00	$27.25	$27.50	$28.00

NONFERROUS METALS

Prompt, wholesale prices in cents per pound

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tin, Straits, spot, New York	41.510	41.381	41.168	38.432	36.871	40.354	43.391	43.251	43.341	45.243	46.246	46.136
Copper, electrolytic, del. Connecticut	10.430	10.000	10.000	10.000	9.600	9.000	9.810	10.125	10.255	10.990	11.250	11.250
Zinc, prime western, East St. Louis	5.000	4.818	4.417	4.150	4.042	4.138	4.750	4.750	4.850	5.014	4.924	4.500
Lead, open market, East St. Louis	4.718	4.482	4.350	4.350	4.250	3.998	4.732	4.750	4.850	4.950	4.941	4.650
Lead, open market, New York	4.868	4.632	4.500	4.500	4.400	4.148	4.882	4.900	5.000	5.100	5.091	4.800
Aluminum, ninety-nine per cent plus	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000
Antimony, American, spot, New York	13.750	13.750	13.750	13.654	12.460	11.731	11.030	10.880	11.310	12.060	12.250	11.455
Nickel, cathodes	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000

WISCONSIN STEEL COMPANY

-:CHICAGO:-

Air view of Wisconsin Steel Company plant by Chicago Aerial Survey Co.

WISCONSIN STEEL COMPANY is well equipped—from raw material source to finished product—to take care of your alloy and carbon steel and pig iron requirements. Our own ore mines, ore boats, coal mines, coking plants, blast furnaces, pig machines, open-hearth furnaces, blooming mill, bar mill, and cold-drawn mill enable us to control our output of high-quality products through every process.

Our large staff of metallurgists and practical foundrymen serves the double purpose of keeping product quality high and rendering a valuable consultation service to our customers.

We invite users of alloy and carbon steel and pig iron to write or phone us for complete information concerning our products.

WISCONSIN STEEL COMPANY

180 North Michigan Avenue Chicago, Illinois

WISCONSIN

Alloy and Carbon Steel **Pig Iron**

Monthly Price Averages for Ten Years

Price Averages for Years Prior to 1929 may be found in STEEL for January 7, 1935

Ores and Alloys

Per Gross Ton

Iron Ore Prices at Date of Buying Movement, Delivered Lower Lake Ports

Season	Date buying movement	Old range Bessemer Ton	Old range Bessemer Cents per unit	Old range Nonbessemer Ton	Old range Nonbessemer Cents per unit	Mesabi Bessemer Ton	Mesabi Bessemer Cents per unit	Mesabi Nonbessemer Ton	Mesabi Nonbessemer Cents per unit	Iron prices, Valley Bessemer	Iron prices, Valley No. 2 Foundry
1938	May 23, 1938	$5.25	$10.194	$5.10	9.903	$5.10	9.903	$4.95	9.612	$24.50	$24.00
1937	Mar. 12, 1937	5.25	10.194	5.10	9.903	5.10	9.903	4.95	9.612	24.50	24.00
1936	Apr. 3, 1936	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	20.00	19.50
1935	May 4, 1935	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	19.00	18.50
1934	May 19, 1934	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	19.00	18.50
1933	June 12, 1933	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	16.00	15.50
1932	June 3, 1932	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	14.50	14.50
1931	Apr. 15, 1931	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	17.00	17.00
1930	Apr. 1, 1930	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	19.00	18.50
1929	Mar. 22, 1929	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	18.50	18.00

Manganese Ore

Dollars Per Gross Ton, Duty Paid, Northern Atlantic Ports, on Basis of 50 Per Cent Ore

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$28.10	$28.10	$28.10	$28.10	$28.10	$28.10	$25.60	$25.60	$25.60	$22.60	$21.10	$21.60
1937	21.10	22.60	22.85	27.60	27.60	27.85	31.85	31.85	31.85	30.60	28.60	28.10
1936*	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	18.60	19.10	19.10	20.60
1935	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70	23.70
1934	21.70	22.70	22.70	22.70	22.70	22.70	22.70	22.70	23.20	23.70	23.70	23.70
1933	19.95	19.95	19.95	19.95	19.95	20.20	20.45	21.45	21.45	21.70	21.70	21.70
1932	22.70	22.70	22.70	22.70	21.70	21.70	21.70	21.70	21.20	21.20	21.20	20.70
1931	24.20	24.20	23.70	23.70	23.70	23.70	23.70	23.70	23.70	22.70	22.70	22.70
1930	29.95	24.70	24.70	24.70	24.70	24.70	24.70	24.20	24.20	24.20	24.20	24.20
1929	27.70	27.70	27.70	27.70	27.70	27.70	26.70	26.70	26.70	25.70	25.70	25.70

*Effective Jan. 1, duty ½c per pound metallic content; $5.60 gross ton on 50 per cent ore.

Bessemer Ferrosilicon, 10 Per Cent

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$33.00	$33.00	$33.00	$33.00	$33.00	$33.00	$29.00	$29.00	$29.00	$30.00	$30.00	$30.00
1937	29.00	29.00	31.80	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
1936	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	29.00
1935	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75
1934	27.25	27.25	27.25	27.25	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75
1933	20.50	20.50	20.50	20.50	20.50	20.75	22.40	24.65	27.00	27.75	27.75	27.75
1932	23.00	22.00	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50
1931	25.00	25.00	25.00	25.00	25.00	25.00	25.00	24.00	23.00	23.00	23.00	23.00
1930	30.00	30.00	30.00	30.00	30.00	29.50	29.00	29.00	25.00	25.00	25.00	25.00
1929	31.00	31.00	31.00	31.00	31.00	31.00	31.00	30.20	30.00	30.00	30.00	30.00

Ferrosilicon, 50 Per Cent

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50	$69.50
1937	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50
1936	77.50	77.50	77.50	77.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50
1935	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50
1934	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50
1933	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50
1932	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	76.30
1931	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	77.50
1930	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50
1929	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50

Spiegeleisen, 20 Per Cent

At Producers' Furnaces

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$33.00	$33.00	$33.00	$33.00	$33.00	$33.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00
1937	26.00	26.00	28.00	30.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
1936	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1935	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1934	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1933	24.00	24.00	24.00	24.00	24.00	24.00	27.00	27.00	27.00	27.00	27.00	27.00
1932	27.00	27.00	27.00	27.00	27.00	26.50	25.00	25.00	25.00	25.00	24.25	24.00
1931	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	27.00
1930	34.00	34.00	34.00	34.00	34.00	34.00	33.00	33.00	33.00	33.00	33.00	30.00
1929	34.00	34.00	34.00	34.00	34.00	34.00	34.00	33.20	33.50	34.00	34.00	34.00

Ferromanganese, 80 Per Cent, del. Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$107.49	$107.49	$107.49	$107.49	$107.77	$107.77	$97.77	$97.77	$97.77	$97.77	$97.77	$97.77
1937	84.79	84.79	92.29	99.79	107.29	107.29	107.29	107.29	107.29	107.29	107.39	107.49
1936*	90.13	80.13	80.13	80.13	80.13	80.13	80.13	80.13	80.13	80.13	80.13	82.65
1935	89.79	89.79	89.79	89.85	90.13	90.13	90.13	90.13	90.13	90.13	90.13	90.13
1934	90.24	90.24	90.24	90.24	90.24	90.00	89.79	89.79	89.79	89.79	89.79	89.79
1933	73.24	73.24	73.24	73.24	73.24	73.24	84.44	87.24	87.24	87.24	87.24	87.24
1932	79.85	80.24	80.24	80.24	80.24	74.99	73.24	73.24	73.24	73.24	73.24	73.24
1931	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	79.79
1930	104.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	93.25
1929	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	104.79

*Duty of 1 cent per pound contained manganese became effective on ferromanganese Jan. 1, 1936.

Pig Iron

Per Gross Ton

Basic, Valley

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$23.50	$23.50	$23.50	$23.50	$23.50	$23.50	$19.50	$19.50	$19.50	$20.50	$20.50	$20.50
1937	20.50	20.50	23.10	23.50	23.50	23.50	23.50	23.50	23.50	23.50	23.50	23.50
1936	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.25	20.00
1935	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	19.00	19.00
1934	17.00	17.00	17.00	17.60	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
1933	14.00	14.00	14.00	14.00	14.40	15.00	15.60	16.00	17.00	17.00	17.00	17.00
1932	15.00	15.00	15.00	15.00	15.00	14.50	14.00	14.00	14.00	14.00	14.00	14.00
1931	17.00	16.75	16.75	17.00	17.00	17.00	17.00	17.00	17.00	16.60	15.00	15.00
1930	18.50	18.50	18.50	18.50	18.50	18.50	18.25	18.00	17.75	17.00	17.00	17.00
1929	17.50	17.50	17.60	18.00	18.30	18.50	18.50	18.50	18.50	18.50	18.50	18.50

Bessemer, delivered Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$25.26	$25.26	$25.26	$25.34	$25.34	$25.34	$21.34	$21.34	$21.34	$22.34	$22.34	$22.34
1937	22.31	22.30	24.85	25.26	25.26	25.26	25.26	25.26	25.26	25.26	25.26	25.26
1936	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.81	20.81	21.06	21.81
1935	19.76	19.76	19.76	19.76	19.80	19.81	19.81	19.81	19.81	19.81	20.81	20.81
1934	19.26	19.26	19.26	19.56	19.76	19.76	19.76	19.76	19.76	19.76	19.76	19.76
1933	15.76	15.76	15.76	16.26	16.66	17.26	17.86	18.26	19.26	19.26	19.26	19.26
1932	17.26	16.96	16.76	16.76	16.15	15.95	15.76	15.76	15.76	15.76	15.76	15.76
1931	18.76	18.51	18.26	18.26	18.26	18.26	18.26	18.26	18.26	18.16	17.76	15.71
1930	20.76	20.76	20.76	20.76	20.76	20.76	20.46	20.26	24.13	19.36	18.63	18.76
1929	19.96	19.86	20.11	20.26	20.56	20.76	20.76	20.76	20.76	20.76	20.76	20.76

No. 2 Foundry, f.o.b. Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$24.00	$24.00	$24.00	$24.00	$24.00	$24.00	$20.00	$20.00	$20.00	$21.00	$21.00	$21.00
1937	21.00	21.00	23.20	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
1986	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.75	20.50
1935	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.75	19.50	19.50
1934	17.50	17.50	17.50	18.25	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	15.50	15.50	15.50	15.50	15.90	16.00	16.75	17.00	17.50	17.50	17.50	17.50
1932	16.50	16.50	16.50	16.00	15.60	16.00	15.50	15.50	15.50	15.50	15.50	15.50
1931	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.20	17.00	16.60
1930	20.00	20.00	19.50	19.40	19.00	18.40	17.90	17.50	17.50	17.50	17.50	17.50
1929	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00

No. 2X Foundry, delivered Philadelphia

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$26.21	$26.21	$26.21	$26.21	$26.21	$26.21	$22.21	$22.21	$22.21	$23.21	$23.21	$23.21
1937	23.14	23.39	25.64	26.14	26.14	26.14	26.14	26.14	26.14	26.14	26.14	26.14
1936	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.68	21.93	22.68
1935	20.63	20.63	20.63	20.63	20.68	20.68	20.68	20.68	20.68	20.68	21.68	21.68
1934	19.63	19.63	19.63	20.38	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63
1933	13.76	13.76	13.76	14.51	15.91	16.76	17.28	17.88	18.63	18.63	18.63	19.63
1932	15.76	15.76	15.76	15.66	15.13	14.76	14.76	14.51	14.26	14.16	13.95	13.88
1931	18.26	18.26	18.26	18.26	17.76	17.76	17.76	17.51	17.01	16.01	16.01	15.76
1930	21.56	21.26	20.76	20.76	20.26	20.26	20.26	19.76	19.76	19.26	19.13	18.2
1929	22.26	22.01	22.26	22.26	22.76	22.76	22.76	22.26	22.26	22.26	22.26	[illegible]

No. 2X Foundry, f.o.b. Buffalo

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$24.00	$24.00	$24.00	$24.00	$24.00	$24.00	$20.00	$20.00	$20.00	$21.00	$21.00	$21.00
1937	21.00	21.25	23.50	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
1936	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.75	19.75
1935	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	19.50	19.50
1934	17.50	17.50	17.50	18.25	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	16.50	16.50	16.50	16.50	16.50	16.50	17.10	17.75	17.50	17.50	17.50	17.50
1932	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50
1931	18.00	18.00	18.00	18.00	17.60	17.50	17.50	17.50	17.50	17.50	17.50	17.50
1930	19.40	19.00	19.00	19.00	19.00	19.00	19.00	18.75	19.00	18.40	18.00	18.00
1929	19.00	19.00	19.25	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00

PRICE HISTORY

Southern No. 2, f.o.b. Birmingham

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$20.38	$20.38	$20.38	$20.38	$20.38	$20.38	$16.38	$16.38	$16.38	$17.38	$17.38	$17.38
1937	17.38	17.63	19.88	20.38	20.38	20.38	20.38	20.38	20.38	20.38	20.38	20.38
1936	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.50	15.84	15.75
1935	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.75	15.50
1934	13.50	13.50	13.50	14.25	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50
1933	11.00	11.00	11.00	11.40	12.00	12.00	12.60	13.00	13.50	13.50	13.50	13.50
1932	12.00	11.20	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1931	14.00	13.00	13.00	13.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
1930	14.70	15.00	14.50	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
1929	16.50	16.50	16.50	15.50	15.50	15.25	14.00	14.00	14.00	14.00	14.00	14.00

Malleable, f.o.b. Valley

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$24.00	$24.00	$24.00	$24.00	$24.00	$24.00	$20.00	$20.00	$20.00	$21.00	$21.00	$21.00
1937	21.00	21.00	23.60	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
1936	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.50	19.75	20.50
1935	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	19.50	19.50
1934	17.50	17.50	17.50	18.10	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	14.50	14.50	14.50	14.50	14.90	15.50	16.10	16.50	17.50	17.50	17.50	17.50
1932	16.00	15.50	15.50	15.50	15.00	14.50	14.50	14.50	14.50	14.50	14.50	14.50
1931	17.50	17.25	17.00	17.00	17.00	17.00	17.00	17.00	17.00	16.90	16.50	16.00
1930	19.00	19.00	19.00	19.00	19.00	19.00	18.75	18.50	18.35	17.80	17.50	17.50
1929	18.00	18.00	18.10	18.50	18.80	19.00	19.00	19.00	19.00	19.00	19.00	19.00

Standard Low Phosphorus, delivered Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	29.63	$29.63	$29.63	$29.70	$29.74	$29.74	$26.74	$26.74	$26.74	$27.74	$27.74	$27.74
1937	26.63	26.88	29.63	29.63	29.63	29.63	29.63	29.63	29.63	29.63	29.63	29.63
1936	25.13	25.13	25.13	25.13	25.13	25.13	25.13	25.13	25.13	25.13	25.38	26.13
1935	24.63	24.63	24.63	24.63	24.68	24.68	24.68	24.68	24.68	24.68	24.68	24.68
1934	24.13	24.13	24.13	24.13	24.63	24.63	24.63	24.63	24.63	24.63	24.63	24.63
1933	20.75	20.50	20.50	20.50	21.68	22.00	22.80	23.50	23.13	23.13	23.13	24.13
1932	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76
1931	24.76	24.76	24.76	24.76	24.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76
1930	24.76	24.76	24.76	24.76	24.76	24.26	24.26	24.26	24.76	24.76	24.76	24.76
1929	24.26	24.26	24.26	24.26	24.26	24.26	24.26	24.26	24.76	24.76	24.76	24.76

Lake Superior Charcoal, delivered Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$30.24	$30.24	$30.24	$30.34	$30.34	$30.34	$28.34	$28.34	$28.34	$28.34	$28.34	$28.34
1937	26.54	26.54	28.95	30.04	30.04	30.04	30.04	30.04	30.04	30.04	30.14	30.24
1936	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.25	25.50	26.25
1935	24.04	24.04	24.04	24.15	24.25	24.25	24.25	24.25	24.25	24.90	25.25	25.25
1934	23.54	23.54	23.54	23.66	24.04	24.04	24.04	24.04	24.04	24.04	24.04	24.04
1933	23.04	23.04	23.04	23.06	23.04	23.04	23.04	23.04	23.54	23.54	23.54	23.54
1932	22.29	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.04	24.04	23.04
1931	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	25.54	25.04	25.04	20.79
1930	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04
1929	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04

Semifinished Material

Per Gross Ton f. o. b.

Open Hearth and Bessemer Billets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$37.00	$37.00	$37.00	$37.00	$37.00	$37.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00
1937	34.00	34.00	36.40	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1936	29.00	29.00	28.40	28.00	28.00	28.00	30.00	30.00	30.00	32.00	32.00	32.00
1935	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	27.00	28.50	29.00
1934	26.00	26.00	26.00	27.80	29.00	29.00	27.40	27.00	27.00	27.00	27.00	27.00
1933	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1932	27.50	27.00	27.00	27.00	27.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1931	30.00	30.00	30.00	30.00	30.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
1930	33.80	33.00	33.00	33.00	32.20	31.25	31.00	31.00	31.00	31.00	31.00	30.50
1929	33.00	34.25	34.00	34.50	36.00	35.75	35.00	35.00	35.00	35.00	35.00	34.75

Open Hearth and Bessemer Sheet Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$37.00	$37.00	$37.00	$37.00	$37.00	$37.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00
1937	34.00	34.00	36.40	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1936	30.00	30.00	28.50	28.00	28.00	28.00	30.00	30.00	30.00	32.00	32.00	32.00
1935	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	29.50	30.00
1934	26.00	26.00	26.00	28.40	30.00	30.00	28.40	28.00	28.00	28.00	28.00	28.00
1933	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1932	27.50	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1931	30.00	30.00	30.00	30.00	29.75	29.00	29.00	29.00	29.00	29.00	29.00	29.00
1930	33.80	33.00	33.00	33.00	32.20	31.25	31.00	31.00	31.00	31.00	31.00	30.50
1929	34.00	33.25	35.00	35.25	26.00	35.75	35.00	35.00	35.00	35.00	35.00	34.75

Wire Rods, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$47.00	$47.00	$47.00	$47.00	$47.00	$47.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00
1937	43.00	43.00	46.20	47.00	47.00	47.00	47.00	47.00	47.00	47.00	47.00	47.00
1936	40.00	40.00	40.00	40.00	40.00	38.80	38.00	38.00	38.00	40.00	40.00	40.00
1935	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.50	40.00
1934	36.00	36.00	36.00	37.20	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
1933	36.20	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	36.00
1932	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1931	35.00	35.00	36.00	36.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
1930	40.00	40.00	38.00	38.00	36.40	36.00	36.00	36.00	36.00	36.00	36.00	35.50
1929	42.00	42.00	42.00	42.00	42.00	42.00	42.00	42.00	42.00	42.00	40.00	40.00

Beehive Coke

Net Ton

Foundry, Spot, Connellsville

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$5.25	$5.25	$5.25	$5.25	$5.25	$5.05	$5.00	$5.00	$5.00	$5.00	$5.00	$5.05
1937	4.25	4.25	4.25	5.05	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30
1936	4.00	4.20	4.10	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
1935	4.60	4.60	4.60	4.60	4.60	4.60	4.25	4.00	4.00	4.35	4.35	4.25
1934	4.25	4.25	4.25	4.55	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60
1933	2.50	2.50	2.25	2.25	2.25	2.40	2.80	3.10	3.15	3.85	4.25	4.25
1932	3.25	3.25	3.25	3.25	3.15	3.00	3.00	2.90	2.75	2.75	2.65	2.50
1931	3.30	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
1930	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1929	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.55	3.50

Furnace, Spot, Connellsville

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$4.25	$4.25	$4.25	$4.25	$4.25	$3.90	$3.75	$3.75	$3.75	$3.75	$3.75	$3.75
1937	4.00	4.00	4.05	4.50	4.85	4.65	4.50	4.50	4.45	4.40	4.37	4.37
1936	3.50	3.50	3.50	3.50	3.50	3.50	3.45	3.45	3.90	4.00	4.00	4.00
1935	3.60	3.60	3.60	3.60	3.60	3.50	3.30	3.25	3.25	3.55	3.55	3.65
1934	3.60	3.50	3.35	3.30	3.45	3.60	3.60	3.60	3.60	3.60	3.60	3.60
1933	1.75	1.75	1.75	1.75	1.75	1.80	2.40	2.75	2.50	3.25	3.75	3.75
1932	2.25	2.25	2.25	2.25	2.15	2.00	2.00	2.00	2.00	2.00	1.80	1.80
1931	2.50	2.50	2.50	2.50	2.45	2.40	2.40	2.40	2.40	2.40	2.35	2.30
1930	3.55	2.60	2.60	2.60	2.55	2.50	2.50	2.50	2.60	2.60	2.55	2.50
1929	2.75	2.90	2.95	2.75	2.75	2.75	2.75	2.75	2.65	2.65	2.65	2.65

Iron and Steel Scrap

Per Gross Ton Delivered

Heavy Melting Steel, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	14.05	$14.15	$13.65	$12.79	$11.55	$11.40	$13.75	$15.20	$15.25	$14.95	$14.85	$15.75
1937	18.95	19.65	22.40	22.75	19.00	18.40	19.40	21.85	20.40	17.15	14.10	12.75
1936	14.50	14.80	15.75	15.75	14.75	13.80	14.15	16.00	17.75	18.15	17.25	18.50
1935	13.50	13.25	12.40	11.70	12.00	12.25	12.30	13.25	13.45	13.65	13.65	14.05
1934	13.05	13.90	14.35	14.15	12.80	11.90	12.00	11.45	10.75	10.50	11.15	12.95
1933	8.35	8.25	8.75	9.90	11.65	11.65	12.70	13.75	13.00	12.45	11.65	11.50
1932	10.25	10.25	10.25	10.20	9.75	9.00	8.35	8.55	9.50	9.50	9.15	8.75
1931	13.00	12.75	12.90	12.50	11.25	10.30	10.50	10.70	10.80	10.45	10.25	10.25
1930	16.55	16.90	16.60	16.05	15.40	15.10	14.90	15.20	15.70	14.80	12.85	12.75
1929	19.00	18.60	18.50	18.60	17.85	18.30	18.45	18.90	18.45	17.30	16.30	15.10

Heavy Melting Steel, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$13.25	$12.15	$12.20	$11.45	$11.05	$10.25	$12.05	$14.00	$13.60	$13.05	$14.20	$14.25
1937	18.25	19.50	20.90	20.75	17.55	16.00	17.75	19.75	17.85	13.95	12.55	11.50
1936	13.40	14.30	14.75	14.35	13.05	12.75	13.25	15.45	16.15	16.25	16.50	16.50
1935	12.15	11.65	10.45	10.05	10.20	10.25	10.40	12.35	12.55	12.50	13.20	13.75
1934	10.44	10.87	12.00	11.75	11.13	9.75	9.55	9.25	8.65	8.75	9.00	10.15
1933	5.25	5.25	5.25	6.55	8.70	8.80	10.45	10.40	9.95	9.35	8.35	8.75
1932	7.25	6.80	6.75	6.55	6.20	5.60	4.50	5.40	5.75	6.00	5.75	5.50
1931	10.00	9.85	9.75	9.60	8.65	8.50	8.50	8.25	7.95	7.75	7.65	7.50
1930	12.65	13.25	13.20	13.00	12.55	12.05	12.00	12.00	12.25	11.55	10.20	10.00
1929	16.50	16.00	15.55	15.95	15.45	14.95	14.75	15.05	15.05	14.45	13.05	12.50

Heavy Melting Steel, Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$14.95	$14.75	$14.44	$13.45	$12.25	$11.85	$13.72	$14.50	$14.25	$14.65	$14.75	$14.75
1937	17.50	18.75	19.75	20.44	18.40	17.03	18.40	19.75	19.22	16.55	14.00	14.00
1936	12.37	13.15	13.46	13.75	12.65	11.70	12.25	13.85	15.37	15.65	14.81	15.63
1935	11.40	11.25	10.60	10.15	10.45	10.45	10.30	11.40	12.20	12.00	12.05	12.25
1934	11.63	11.73	11.70	11.50	11.00	10.40	10.25	9.85	9.60	9.50	9.95	10.85
1933	6.50	6.50	6.50	6.90	9.00	9.50	10.55	12.00	10.70	10.20	9.55	10.50
1932	7.50	7.35	7.35	7.20	6.50	6.25	6.25	6.40	7.25	7.25	7.25	6.50
1931	10.50	10.50	10.50	10.00	9.50	8.75	8.25	8.55	8.75	8.20	7.95	7.50
1930	14.50	14.50	14.95	13.95	13.40	13.25	12.50	12.65	13.00	12.00	11.50	11.00
1929	16.50	16.30	16.25	17.00	16.25	16.25	16.50	16.75	16.37	15.80	15.15	14.50

Compressed Sheets, Detroit (dealers)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$10.50	$10.50	$9.95	$8.45	$7.60	$7.30	$10.20	$11.45	$11.85	$11.65	$11.80	$12.00
1937	15.75	16.10	18.25	19.50	16.55	15.50	17.00	18.25	17.95	14.15	10.20	10.25
1936	10.45	11.55	12.50	12.10	10.85	10.50	11.05	12.75	14.25	14.40	13.60	13.95
1935	10.00	9.60	7.95	7.75	7.95	8.50	8.75	9.80	10.05	10.05	9.75	9.90
1934	8.50	9.40	10.30	9.70	8.90	7.90	8.00	7.80	7.75	7.50	7.75	9.00
1933	4.00	4.00	4.06	5.15	7.50	7.80	8.85	9.50	8.55	7.35	7.00	7.45
1932	5.55	5.75	5.75	5.70	5.10	4.75	3.75	3.80	5.00	5.50	5.05	4.06
1931	8.92	9.45	9.00	9.00	7.75	6.95	6.95	6.80	6.50	6.15	6.00	6.00
1930	12.00	11.75	11.40	11.25	10.85	10.50	10.50	10.85	11.15	10.90	9.65	8.81
1929	14.65	14.45	14.00	14.00	14.00	13.65	14.00	14.00	14.00	13.40	12.15	11.50

No. 1 Cast, Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$16.25	$16.19	$15.75	$15.30	$14.75	$14.75	$15.85	$16.75	$16.75	$16.75	$16.75	$16.75
1937	18.85	19.00	20.69	22.50	20.35	18.81	19.55	21.65	20.50	18.95	16.75	16.75
1936	12.75	13.45	17.00	14.88	14.15	13.75	14.31	15.55	16.62	16.65	16.25	17.75
1935	11.60	11.95	11.75	11.55	11.50	11.50	11.50	11.60	12.25	12.25	12.75	12.75
1934	11.50	11.65	12.30	12.50	12.15	12.00	11.25	11.00	11.00	11.00	11.00	12.25
1933	9.00	9.00	9.00	9.10	10.25	10.35	11.20	11.75	12.40	12.00	11.95	12.00
1932	11.20	10.00	10.00	9.50	9.25	9.00	9.00	9.25	9.25	9.00	9.00	9.00
1931	12.80	13.00	13.00	13.00	12.75	12.50	12.50	12.50	12.50	12.50	11.70	11.50
1930	16.00	15.75	15.75	15.50	15.00	14.75	13.50	13.50	13.50	13.50	13.50	12.50
1929	16.75	16.75	16.50	16.50	16.50	16.50	16.50	16.50	16.25	16.25	16.00	16.00

Cast Borings, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$7.25	$7.25	$6.75	$6.25	$6.25	$5.90	$7.05	$7.75	$8.15	$8.65	$8.50	$8.50
1937	14.40	14.00	14.40	14.50	14.10	14.00	14.65	15.20	14.90	12.95	8.75	7.25
1936	8.30	8.75	8.70	8.75	8.75	8.05	7.90	10.90	11.95	11.65	11.50	13.00
1935	6.50	6.90	7.00	6.10	6.00	6.65	6.50	7.00	7.30	8.15	8.15	8.00
1934	7.30	8.15	8.70	8.50	8.25	7.75	7.25	7.05	6.25	5.50	5.90	6.00
1933	5.70	5.70	5.55	5.70	6.90	7.65	9.05	9.80	9.05	8.30	7.60	7.50
1932	6.75	6.50	6.75	6.65	6.40	5.50	4.75	5.15	5.95	6.25	6.50	5.90
1931	7.70	7.70	7.65	7.60	7.50	7.75	7.05	7.50	7.45	7.50	7.10	6.80
1930	11.10	12.00	11.15	10.75	10.50	9.88	8.50	8.50	8.90	8.40	7.75	7.15
1929	12.55	12.25	11.50	12.15	11.55	11.85	12.10	12.50	12.40	11.80	11.15	10.75

Machine Shop Turnings, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$8.00	$8.85	$7.75	$7.05	$6.75	$6.30	$7.85	$9.25	$9.45	$9.65	$9.70	$10.00
1937	14.15	14.25	15.55	15.25	14.80	14.00	14.05	15.05	14.75	11.75	8.55	7.25
1936	9.75	10.20	10.50	10.50	9.75	9.40	9.50	10.70	12.40	12.45	11.75	12.90
1935	8.95	8.80	7.40	7.40	8.15	8.25	8.15	8.80	9.55	9.70	9.45	9.65
1934	9.05	10.00	10.75	10.15	8.20	7.45	7.50	8.00	7.30	7.00	7.20	8.50
1933	6.25	6.25	6.30	6.75	8.00	8.40	9.35	10.45	9.75	9.30	8.00	8.00
1932	6.95	7.10	7.25	6.75	6.30	5.25	5.00	5.25	5.95	6.00	6.25	6.00
1931	6.00	6.80	7.80	7.30	6.75	6.50	6.70	7.30	7.50	7.20	7.00	7.00
1930	11.50	11.75	11.00	11.00	10.20	9.50	8.70	8.00	8.00	7.20	6.15	6.00
1929	12.50	11.25	10.65	11.05	11.00	11.35	11.85	12.40	12.00	11.40	10.75	10.25

Finished Material

Per Pound f. o. b.

Steel Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	2.45c	2.45c	2.45c	2.45c	2.45c	2.45c	2.25c	2.25c	2.25c	2.25c	2.25c	2.25c
1937	2.20	2.20	2.40	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45
1936	1.85	1.85	1.85	1.85	1.85	1.85	1.95	1.95	1.95	2.05	2.05	2.05
1935	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.85	1.85	1.85	1.85
1934	1.75	1.75	1.75	1.85	1.90	1.90	1.80	1.80	1.80	1.80	1.80	1.80
1933	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.75	1.75	1.75
1932	1.55	1.50	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1931	1.65	1.65	1.65	1.65	1.65	1.65	1.60	1.60	1.60	1.60	1.60	1.60
1930	1.90	1.85	1.85	1.80	1.75	1.75	1.70	1.65	1.60	1.60	1.60	1.60
1929	1.90	1.90	1.90	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.90

Tank Plates, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1838	2.25c	2.25c	2.25c	2.25c	2.25c	2.25c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c
1937	2.05	2.05	2.20	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
1986	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1935	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
1934	1.70	1.70	1.70	1.80	1.85	1.85	1.80	1.80	1.80	1.80	1.80	1.80
1933	1.60	1.60	1.60	1.55	1.50	1.55	1.60	1.60	1.60	1.70	1.70	1.70
1932	1.55	1.50	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1931	1.65	1.65	1.65	1.65	1.65	1.65	1.60	1.60	1.60	1.60	1.60	1.50
1930	1.90	1.85	1.80	1.80	1.75	1.70	1.65	1.65	1.60	1.60	1.60	1.60
1929	1.90	1.90	1.90	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90

Structural Shapes, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	2.25c	2.25c	2.25c	2.25c	2.25c	2.25c	2.10c	2.10c	2.10c	2.10c	2.10c	2.10c
1937	2.05	2.05	2.20	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
1936	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1935	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
1934	1.70	1.70	1.70	1.80	1.85	1.85	1.80	1.80	1.80	1.80	1.80	1.80
1933	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.70	1.70	1.70
1932	1.55	1.50	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1931	1.60	1.60	1.60	1.65	1.65	1.65	1.60	1.60	1.60	1.60	1.60	1.50
1930	1.90	1.85	1.80	1.80	1.75	1.70	1.65	1.65	1.60	1.60	1.60	1.60
1929	1.90	1.90	1.90	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90

Hot-Rolled Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	*2.15c	2.15c	2.15c	2.15c	2.15c	2.15c
1937	2.15	2.15	2.35	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
1936	1.85	1.85	1.85	1.85	1.85	1.85	1.95	1.95	1.95	1.95	1.95	2.10
1935	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
1934	1.75	1.75	1.75	1.90	2.00	2.00	1.85	1.85	1.85	1.85	1.85	1.85
1933	1.65	1.60	1.55	1.55	1.55	1.65	1.75	1.65	1.70	1.75	1.75	1.75
1932	1.75	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
1931	1.90	1.90	1.90	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
1930	2.15	2.10	2.10	2.10	2.00	2.00	2.00	1.95	1.95	1.95	1.90	1.90
1929	2.10	2.10	2.10	2.15	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.15

*Succeeded No. 10 blue annealed June 24.

Cold-Rolled Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	3.55c	3.45c	3.45c	3.45c	3.45c	3.45c	3.20c	3.20c	3.20c	3.20c	3.20c	3.20c
1937	3.25	3.25	3.50	3.55	2.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55
1936	2.95	2.95	2.95	2.95	2.95	2.95	3.05	3.05	3.05	3.05	3.05	3.05
1935	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95
1934	2.75	2.75	2.75	3.05	3.15	3.10	2.95	2.95	2.95	2.95	2.95	2.95
1933	2.40	2.45	2.45	2.55	2.55	2.55	2.55	2.60	2.75	2.75	2.75	2.75
1932	2.90	2.85	2.85	2.80	2.80	2.80	2.80	2.70	2.75	2.65	2.60	2.60
1931	3.30	3.30	3.30	3.15	3.05	3.10	3.10	3.10	3.10	3.10	3.10	3.00
1930	3.90	3.90	3.90	3.80	3.80	3.60	3.60	3.60	3.60	3.45	3.35	3.30
1929	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.05	4.00	4.00

No. 24 Galvanized Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	3.80c	3.80c	3.80c	3.80c	3.80c	3.75c	3.50c	3.50c	3.50c	3.50c	3.50c	3.50c
1937	3.40	3.40	3.70	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
1936	3.10	3.10	3.10	3.10	3.10	3.10	3.20	3.20	3.20	3.20	3.20	3.35
1935	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
1934	2.85	2.85	2.85	3.10	3.25	3.25	3.10	3.10	3.10	3.10	3.10	3.10
1933	2.70	2.50	2.60	2.65	2.70	2.70	2.85	2.85	2.85	2.85	2.85	2.85
1932	2.80	2.75	2.80	2.85	2.85	2.85	2.85	2.80	2.75	2.80	2.85	2.85
1931	2.90	2.90	2.90	2.85	2.80	2.80	2.90	2.90	2.90	2.90	2.90	2.90
1930	3.35	3.30	3.30	3.30	3.25	3.20	3.15	3.10	3.00	3.00	2.95	2.90
1929	3.60	3.60	3.60	3.65	3.70	3.65	3.60	3.55	3.50	3.50	3.45	3.40

Cold-Finished Steel Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.70c	2.70c	2.70c	2.70c	2.70c	2.70c
1937	2.55	2.55	2.85	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
1936	2.10	2.10	2.10	2.10	2.10	2.15	2.25	2.25	2.25	2.35	2.35	2.55
1935	2.10	2.10	2.10	2.00	1.95	1.95	1.95	1.95	1.95	1.95	1.95	2.05
1934	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
1933	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.95	1.95	1.95	1.95	1.95
1932	2.00	2.00	1.90	1.90	1.75	1.70	1.70	1.70	1.70	1.70	1.70	1.70
1931	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.00
1930	2.15	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.05	2.00
1929	2.20	2.20	2.25	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.20	2.20

Tin Plate, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$5.35	$5.35	$5.35	$5.35	$5.35	$5.35	$5.35	$5.35	$5.35	$5.35	*$5.10	$5.00
1937	4.85	4.85	4.85	5.25	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35
1936	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
1935	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
1934	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
1933	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.65	4.65	4.65	5.25
1932	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.50	4.25
1931	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.75	4.75	4.75
1930	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.00	5.00	5.00
1929	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35

*Refund of 25 cents per box on all contracts Jan. 1 to Nov. 10.

PRICE HISTORY

Cold-Rolled Strip, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	3.20c	3.20c	3.20c	3.20c	3.20c	3.10c	2.95c	2.95c	2.95c	2.90c	2.90c	2.90c
1937	2.85	2.85	3.15	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
1936	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.80
1935	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
1934	2.40	2.40	2.40	2.65	2.80	2.80	2.60	2.60	2.60	2.60	2.60	2.60
1933	1.95	1.80	1.85	1.80	1.90	2.00	2.25	2.25	2.30	2.40	2.40	2.40
1932	2.00	1.90	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.95	2.00	2.00
1931	2.25	2.25	2.25	2.20	2.15	2.15	2.15	2.15	2.15	2.15	2.10	2.05
1930	2.70	2.65	2.60	2.55	2.50	2.45	2.45	2.40	2.35	2.35	2.35	2.25
1929	2.85	2.85	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75

Hot-Rolled Strip, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.15c	2.15c	2.15c	2.10c	2.10c	2.10c
1937	2.15	2.15	2.35	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
1936	1.85	1.85	1.85	1.85	1.85	1.85	1.95	1.95	1.95	1.95	1.95	2.10
1935	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
1934	1.75	1.75	1.75	1.95	2.00	2.00	1.85	1.85	1.85	1.85	1.85	1.85
1933	1.45	1.45	1.45	1.45	1.55	1.55	1.60	1.65	1.70	1.75	1.75	1.75
1932	1.40	1.40	1.40	1.45	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45
1931	1.55	1.55	1.55	1.55	1.50	1.50	1.55	1.55	1.55	1.55	1.50	1.45
1930	1.85	1.80	1.80	1.70	1.70	1.70	1.65	1.65	1.65	1.60	1.55	1.55
1929	1.80	1.85	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90

Plain Wire, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c
1937	2.60	2.60	2.85	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
1936	2.30	2.30	2.30	2.40	2.40	2.40	2.40	2.40	2.40	2.50	2.50	2.60
1935	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
1934	2.20	2.20	2.20	2.25	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
1933	2.15	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.20
1932	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
1931	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
1930	2.40	2.40	2.40	2.40	2.35	2.30	2.30	2.30	2.30	2.30	2.30	2.25
1929	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.45	2.40	2.40	2.40

Wire Nails, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	2.75c	2.75c	2.75c	2.75c	2.75c	2.75c	2.45c	2.45c	2.45c	2.45c	2.45c	2.45c
1937	2.25	2.25	2.70	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1936	2.40	2.40	2.15	2.10	2.10	2.10	2.10	2.10	1.95	2.05	2.05	2.20
1935	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.55	2.40	2.40	2.40	2.40
1934	2.35	2.35	2.35	2.50	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
1933	1.90	1.85	1.85	1.85	1.85	1.85	2.05	2.10	2.10	2.10	2.10	2.35
1932	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95
1931	1.90	1.90	1.90	1.90	1.90	1.80	1.85	1.90	1.90	1.90	1.90	1.90
1930	2.35	2.30	2.30	2.25	2.15	2.15	2.10	2.05	2.00	2.00	1.95	1.90
1929	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.50	2.45	2.40	2.40

Rail Steel Bars, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	2.35c	2.35c	2.35c	2.35c	2.35c	2.35c	2.15c	2.10c	2.10c	2.10c	2.10c	2.10c
1937	2.10	2.10	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35
1936	1.75	1.75	1.75	1.75	1.75	1.75	1.85	1.85	1.85	1.95	1.95	1.95
1935	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
1934	1.70	1.70	1.70	1.79	1.85	1.85	1.77	1.75	1.75	1.75	1.75	1.75
1933	1.50	1.45	1.45	1.45	1.50	1.50	1.50	1.50	1.60	1.70	1.70	1.70
1932	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
1931	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.50	1.50	1.50
1930	1.85	1.85	1.85	1.85	1.80	1.75	1.75	1.65	1.65	1.65	1.65	1.65
1929	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.95	1.90

Structural Rivets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	3.60c	3.60c	3.60c	3.60c	3.60c	3.60c	3.40c	3.40c	3.40c	3.40c	3.40c	3.40c
1937	3.25	3.25	3.45	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
1936	2.90	2.90	2.90	2.90	2.90	2.95	3.05	3.05	3.05	3.05	3.05	3.20
1935	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
1934	2.75	2.75	2.75	2.90	3.00	3.00	2.95	2.90	2.90	2.90	2.90	2.90
1933	2.25	2.25	2.25	2.25	2.25	2.35	2.50	2.50	2.50	2.60	2.75	2.75
1932	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
1931	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.55	2.30	2.25	2.25
1930	3.10	3.10	3.10	3.10	3.00	2.90	2.90	2.75	2.75	2.75	2.75	2.75
1929	2.85	2.90	2.95	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10

Cast Iron Pipe, Birmingham

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1938	$46.00	$46.00	$46.00	$46.00	$46.00	$46.00	$42.60	$42.00	$42.00	$42.00	$42.00	$42.00
1937	41.00	41.00	44.75	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00	46.00
1936	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	41.00
1935	38.00	38.00	38.00	38.50	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00
1934	36.00	36.00	36.00	36.00	36.00	36.40	38.00	38.00	38.00	38.00	38.00	38.00
1933	32.00	32.00	32.00	32.00	32.00	34.25	35.00	35.00	35.00	35.00	35.25	36.00
1932	33.00	32.20	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00
1931	37.00	37.00	36.50	35.00	35.00	35.00	35.00	35.00	33.00	33.00	33.00	33.00
1930	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1929	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00

Steel, Iron and Scrap Price Composites

Compiled by STEEL

Iron and Steel Price Composite

	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927
Jan.	$38.95	$36.55	$33.34	$32.58	$31.15	$28.17	$29.65	$31.69	$35.19	$35.94	$33.48	$36.17
Feb.	38.90	36.74	33.48	32.54	31.30	27.94	29.24	31.64	34.92	35.96	33.81	35.49
March	38.80	39.92	33.20	32.36	31.38	27.92	29.28	31.65	34.79	35.98	33.90	35.47
April	38.61	40.39	33.10	32.29	32.67	27.78	29.44	31.47	34.16	36.40	33.91	35.40
May	38.50	40.06	32.92	32.35	32.97	28.33	29.34	31.07	33.49	36.53	33.75	34.16
June	38.41	39.82	32.79	32.42	32.96	28.71	29.09	30.82	33.28	36.46	33.59	34.90
July	36.32	40.03	33.49	32.44	32.32	29.67	28.87	30.78	33.00	36.33	33.05	34.72
Aug.	36.50	40.34	33.88	32.68	32.24	29.92	28.77	30.73	32.90	36.36	33.47	34.44
Sept.	36.48	40.16	34.15	32.82	32.15	30.36	28.93	30.61	32.76	36.20	33.90	34.40
Oct.	36.48	39.59	34.67	32.84	32.10	30.53	28.90	30.30	32.35	35.85	34.35	33.79
Nov.	36.39	38.96	34.65	33.15	32.15	30.25	28.79	30.16	31.95	35.60	34.77	33.47
Dec.	.....	38.88	35.15	33.31	32.39	31.01	28.28	29.90	31.69	35.43	34.99	33.27
Av. for Year ...	*37.67	39.29	33.73	32.66	32.15	29.22	29.05	30.90	33.37	36.09	33.91	34.64

Includes pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip and cast iron pipe at representative centers. *Eleven months.

Finished Steel Price Composite

	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927
Jan.	$61.70	$55.80	$53.70	$54.00	$51.10	$46.13	$47.28	$49.30	$55.63	$57.83	$55.88	$58.30
Feb.	61.70	55.92	53.70	54.00	51.10	45.35	46.72	49.42	55.03	57.83	56.76	57.23
March	61.70	60.70	52.32	54.00	51.10	45.60	47.09	49.42	54.88	57.83	57.23	57.19
April	61.70	61.45	52.20	54.00	53.90	44.94	47.62	49.22	53.66	58.43	56.55	56.88
May	61.70	61.70	52.20	54.00	54.80	45.10	47.62	49.02	52.60	58.53	56.83	57.15
June	61.55	61.70	52.20	54.00	55.08	45.30	47.64	48.60	52.37	58.43	56.55	56.95
July	57.20	61.70	53.40	54.00	54.05	47.20	47.71	48.68	51.90	58.13	56.05	56.88
Aug.	57.20	61.70	53.40	54.02	54.00	47.50	47.46	48.72	51.72	57.93	56.15	56.95
Sept.	57.20	61.70	53.10	53.70	54.00	48.52	47.50	48.72	50.87	57.43	56.38	56.68
Oct.	57.04	61.70	53.90	53.70	54.00	49.20	47.64	48.22	50.13	56.79	56.75	55.79
Nov.	56.68	61.70	53.90	53.70	54.00	49.20	47.20	48.17	49.62	56.48	57.10	55.18
Dec.	56.50	61.70	53.90	53.70	54.00	51.10	46.74	47.74	49.30	56.33	57.63	54.48
Av. for Year ...	59.32	60.62	53.16	53.90	53.43	47.09	47.35	48.77	52.31	57.66	56.65	56.64

Includes plates, shapes, bars, hot strip, nails, tin plate, pipe.

Steelworks Scrap Price Composite

	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927
Jan.	$13.85	$18.12	$13.15	$12.03	$11.24	$ 6.23	$ 8.03	$10.49	$14.16	$15.97	$13.50	$14.59
Feb.	13.54	19.19	13.83	11.66	11.72	6.33	7.89	10.39	14.42	16.42	13.50	14.26
March	13.20	20.95	14.48	10.75	12.30	6.47	7.94	10.38	14.52	16.24	13.41	14.39
April	12.30	21.27	14.39	10.05	12.15	7.23	7.76	10.12	14.08	16.53	13.54	14.44
May	11.47	18.49	13.40	10.27	11.30	9.23	7.03	9.31	13.65	16.16	13.62	13.67
June	10.89	17.15	12.55	10.45	10.32	9.55	6.62	8.84	13.11	16.04	13.10	13.09
July	13.06	18.51	12.89	10.64	10.30	10.66	6.06	8.70	12.58	16.12	12.57	13.34
Aug.	14.44	20.41	14.66	12.05	9.98	11.57	6.25	8.79	12.62	16.46	13.10	13.50
Sept.	14.23	18.99	16.18	12.65	9.45	10.83	7.04	8.82	12.81	16.39	14.03	13.39
Oct.	14.00	15.93	16.44	12.72	9.40	10.37	6.96	8.50	12.32	15.44	14.94	13.11
Nov.	14.58	13.32	16.05	12.92	9.82	9.64	6.87	8.22	11.17	14.51	15.22	12.86
Dec.	.....	13.24	16.92	13.17	11.02	10.12	6.41	8.16	10.77	13.73	15.30	13.21
Av. for Year ...	*13.23	17.96	14.58	11.61	10.75	9.02	7.07	9.23	13.02	15.83	13.82	13.65

Includes heavy melting steel and hydraulic compressed sheets at representative centers. *Eleven months.

European Iron, Steel Domestic Prices, 1938

At Works or Furnace

BRITISH PRICES IN POUNDS STERLING, PER GROSS TON

	Jan. £ s d	Feb. £ s d	March £ s d	April £ s d	May £ s d	June £ s d	July £ s d	Aug. £ s d	Sept. £ s d	Oct. £ s d	Nov. £ s d	Dec. £ s d
Foundry pig iron, silicon 2.50-3.00*	5- 9-0	5- 9-0	5- 9-0	5- 9-0	5- 9-0	5- 9-0	5- 9-0	5- 9-0	5- 9-0	5- 9-0	5- 9-0	5- 9-0
Basic pig iron*	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0	5- 0-0
Furnace coke	1-16-3	1-13-9	1-12-6	1-12-5	1-12-6	1-10-0	1-10-0	1- 7-6	1- 7-6	1- 7-6	1- 7-6	1- 7-6
Billets	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6
Standard rails	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6
Merchant bars†	11- 9-0	11- 9-0	11- 9-0	11-16-6	12- 4-0	12- 4-0	12- 4-0	12- 4-0	12- 4-0	12- 4-0	12- 4-0	12- 4-0
Shapes†	11- 0-6	11- 0-6	11- 0-6	11- 0-6	11- 0-6	11- 0-6	11- 0-6	11- 0-6	11- 0-6	11- 0-6	11- 0-6	11- 0-6
Plates, ship, bridge and tank†	11-14-3	11-14-3	11-14-3	11-14-3	11-14-3	11-14-3	11-14-3	11-14-3	11-14-3	11-14-3	11-14-3	11-14-3
Sheets, black, 24-gage	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0	15-15-0
Sheets, galvanized, 24-gage, corrugated	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0
Plain wire	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0
Hoops and bands†	12- 4-0	12- 4-0	12- 4-0	12- 7-9	12-19-0	12-19-0	12-19-0	12-19-0	12-19-0	12-19-0	12-19-0	12-19-0

*Delivered Middlesbrough. From November, 1937, a rebate of 5s per ton was granted to users of pig iron who did not buy foreign.

†A rebate of 15s per ton for beams, shapes and plates is obtainable in the home trade when the purchaser undertakes to buy only British steel—except in authorized cases. Since the end of April, this rebate also applies to merchant bars and hoops.

GERMAN PRICES IN REICHSMARKS, PER METRIC TON

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Foundry pig iron, silicon 2.50-3.00	63	63	63	63	63	63	63	63	63	63	63	63
Hematite	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50
Furnace coke	19	19	19	19	19	19	19	19	19	19	19	19
Billets	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50
Standard rails	132	132	132	132	132	132	132	132	132	132	132	132
Merchant bars	110	110	110	110	110	110	110	110	110	110	110	110
Shapes	107	107	107	107	107	107	107	107	107	107	107	107
Plates, 5 millimeters	127	127	127	127	127	127	127	127	127	127	127	127
Sheets, black, 1 to 3 millimeters, basis	144	144	144	144	144	144	144	144	144	144	144	144
Sheets, galvanized, 24-gage, corrugated	370	370	370	370	370	370	370	370	370	370	370	370
Plain wire	173	173	173	173	173	173	173	173	173	173	173	173
Hoops and bands	127	127	127	127	127	127	127	127	127	127	127	127

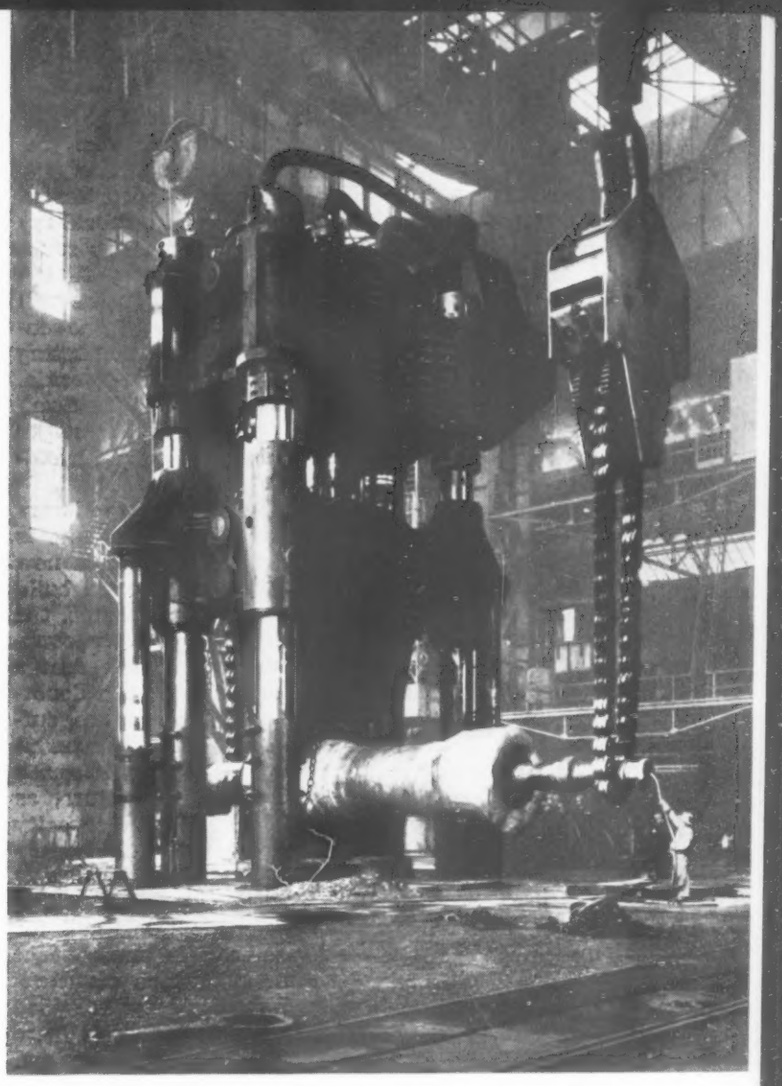
FRENCH PRICES IN FRENCH FRANCS, PER METRIC TON

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Foundry pig iron, Silicon 2.50-3.00	560	563.50	563.50	563.50	598	598	598	598	598	598	598	598
Furnace coke	189	189	205	205	205	205	205	205	205	205	220	225
Billets	840	840	840	840	840	840	840	840	840	840	840	840
Standard rails	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Merchant bars	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080	1080
Shapes	1055	1055	1055	1055	1055	1055	1055	1055	1055	1055	1055	1055
Plates, 5 millimeters	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350
Sheets, black, 2 millimeters	1565	1565	1565	1565	1575	1600	1600	1600	1600	1600	1600	1600
Sheets, galvanized, 0.6-millimeter, corrugated	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250
Plain wire	1660	1660	1660	1660	1660	1660	1660	1650	1650	1650	1650	1650
Hoops and bands	1210	1210	1210	1210	1210	1210	1210	1210	1210	1210	1210	1210

BELGIAN PRICES IN BELGIAN FRANCS, PER METRIC TON

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Foundry pig iron, Silicon 2.50-3.00	730	705	620	580	540	465	440	440	450	490	500	500
Furnace coke	215	215	215	215	215	215	215	215	215	215	215	215
Billets	960	960	960	860	860	860	860	860	860	860	860	860
Standard rails	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375
Merchant bars	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
Shapes	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
Plates, 5 millimeters	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375
Sheets, black, 3 millimeters, basis	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575	1575
Galvanized sheets, corrugated, 0.5-millimeter	2950	2950	2950	2950	2950	2950	2750	2750	2750	2750	2750	2750
Plain wire	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650	1650
Hoops and bands	1550	1550	1500	1300	1300	1300	1300	1300	1300	1300	1300	1300

EUROPEAN MARKET SUMMARY



■ Hydraulic press, 15,000 tons capacity, at Krupps Essen works. Such equipment is aiding rearmament of the Reich, for which steel output is being greatly enlarged

World Steel Trade Adversely Affected by International Disturbances

BY VINCENT DELPORT,
European Manager, STEEL

■ STARTING 1938 under none too favorable auspices, the steel trade experienced a bad stumble in early spring, when Germany gave the world a shock by suddenly annexing Austria. From then onward, international trade shrank further, owing to lack of confidence and anxiety for the future. The climax was reached in midsummer, when the war shadow spread over all Europe. At the crucial time, toward the middle of September, a buying spurt occurred, the Continental steel cartel receiving substantial orders, particularly from the Far East, owing to fears that war might interrupt supplies from Europe.

Taking the year as a whole, steel export trade was dull, and it is not surprising that competition was keen, especially as most countries had started the year at a high production rate. As a natural consequence, the price structure built up by the European steel entente weakened, and concessions on agreed prices were freely made. British and Continental exporters' situation was further affected by continued strong American competition at lower prices than those Europeans could quote officially.

Following protracted and inconclusive negotiations between representatives of American and European steel industries, lower export prices on certain products and for certain markets was decided upon by the European entente. The situation improved to some extent toward the year's end, owing to in-

creasing activities in the American market, and revived demand from several overseas countries.

Apart from impossibility of maintaining prices at the official level, the steel entente and its subsidiary international selling syndicates operated fairly satisfactorily, and were renewed on expiration until the end of 1940. There was little risk that quotas will be exceeded under prevailing conditions. The entente is now faced with the problem of readjusting quotas for Germany, Poland and Czechoslovakia. Negotiations also are being carried out with the Scandinavian group, Holland and Italy, with a view to sharing out export markets in some cases and avoiding uneconomic price competition in others.

A development causing anxiety to leading producers who depend to a large extent on export business is the tendency in certain countries, which until now imported most of their steel requirements, to build up their own steel industry. Turkey is, perhaps, the most notable example of this trend. Other countries, such as Rumania, Holland and South Africa are expanding their existing industries. It is doubtful, however, whether these developments are sufficiently large to render those countries independnt of their erstwhile suppliers. Germany's spectacular enlargement is another problem for the future, as the time may come when a productive steel capacity reaching 25 million tons or more may call for expanded export trade for the Reich, which is already the largest steel exporter in Europe.

No doubt many fields all over the world call for considerably greater steel use than is apparent at present, but this potential demand, which could absorb surplus production in times of plenty, is stifled by continued uncertainty of world politics. There are, as yet, no signs that strife in the Far East and in Spain will abate and the hopes, which sprouted after Munich, that a policy of appeasement would be pursued in Europe somewhat withered as the winter months approached.

In certain countries, domestic conditions also were unfavorable to steel trade expansion. For the best part of the year the British market was clogged with a pig iron and semifinished steel accumulation, which had a most depressing effect on production and trade. One result was drastic reduction of foreign steel imports, which took effect since April. The British Iron and Steel Federation kept its promise to maintain home prices unchanged until the year's end, a few specific increases having been neutralized by an equivalent rebate granted to users who undertook to purchase British steel only.

The official British price policy was criticized in certain quarters, particularly among shipbuilders and automobile manufacturers, who complained that, under prevailing world competition, British prices were too high. Apparently more business would have been released at the end of the year if the price policy had been modified to some extent, and contracts were held back in the hope that lower prices would be fixed as from the beginning of 1939. There was little evidence that any large concession would be made, as British prices are based on actual production costs, and these have shown little tendency to diminish.

France, throughout the year, was in the throes of political disturbances, and its financial economic situation went from bad to worse. Steel production receded almost to the 1932 level, that year being nearly the lowest on record. Export trade also was unsatisfactory. Only drastic measures will insure France regaining her former position among steel-producing countries.

Belgium and Luxemburg were adversely affected by restricted export business, exports being the mainspring in their steel trade. Germany was undoubtedly the most active nation and, apparently, could not produce fast enough to meet domestic needs. The aggrandisement policy which she has followed brings its own problems, which may not be easy to solve. In practically all Continental countries steel prices were generally level.

■ **Modern blast furnace plant at Essen-Borbeck, which aided Germany in producing 18,200,000 tons of pig iron in 1938, second only to the United States. Plans now under way will add materially to this capacity**

British Steel Industry Experiences Lean Year

BY J. A. HORTON,
British Correspondent

■ THE 1938 record in the British iron and steel industry is in sharp contrast to the previous year. Toward the end of 1937, business began to wane, following an extremely active period, but at that time confidence was such that it was believed this was merely a temporary lull, to be succeeded by even greater achievements in the following months.

The actual experience of the last twelve months has proved the falsity of the prophets, and over the greater part of the year the industry declined and output fell to a level which approximates figures of 1934 and 1935. A somewhat better tone became apparent in late autumn, but it is as yet too early to judge whether this portends real recovery, although the next few months probably will give a clear indication.

There is no doubt that British industry suffered a severe shock in the European crisis in September. During those critical days, iron and steel business was almost at a standstill, and although certain branches received a stimulus through demand for materials for air raid precautions, the general situation was not materially affected. Since the crisis, there has been further concentration on armament work, resulting in added work for steel and engineering firms.

Marked Drop in Production

Production figures for the year reveal the trend. It is a disappointing record, particularly when it is compared with the 1937 peak figures. In November, 1937, a new high record was made at 1,178,300 tons of steel, which exceeded the previous record, 1,163,000 tons, two months earlier. By August, 1938, British steel output had dropped to 658,900 tons, a gradual decline being experienced over the summer months, following a period from September, 1937, to March, 1938, when output never dropped below the million-ton mark.

A corresponding decline took place in pig iron production. The peak was in December, 1937, when the output was 783,800 tons. The succeeding months were notable for the gradual shrinkage in output, until by September the figures had dropped to 429,800 tons, rising slightly to 469,400 tons in October. In October, 1937, 133 furnaces were in blast, and at the end of October, 1938, only 76. Steel ingots and castings production during the first ten months amounted to 8,878,100 tons, which compares with 10,681,900 tons in the corresponding period in 1937. For pig iron, the figures were 5,855,400 tons and 6,950,500 tons, respectively.

A rapid accumulation of stocks occurred in the first few months, one of the chief reasons being that threats of stringency had resulted in consumers throwing caution to the winds and ordering material to an extent which could not possibly be justified by existing or potential requirements. The burden of those stocks was experienced over the greater part of the year, and it was not until late October that signs began to indicate that customers had reduced stocks to a point where it became necessary to consider replacements. Continental material was imported heavily during first quarter, largely due to announcement that import duties were to be raised at the end of March on certain iron and steel goods. It will be remembered that they had previously been in operation up to July, 1937, but had been reduced for a period, owing to stringency in British supplies.

In May it was realized by the government that a change had taken place in the pig iron industry. The position was such that home productive capacity, with Empire supplies available, was again adequate to meet the demand. It was, therefore, decided to restore the 33 1/3 per cent import duty which had been in force from 1932 to 1937, but which had been removed to facilitate purchases from other countries.

The year was uneventful as far as prices are concerned, and despite easier conditions which developed in all branches, domestic prices continued on the basis fixed in 1937. When the British Iron and Steel Federation fixed prices for basic steel material in November, 1937, it was stated that the basis would continue to the end of 1938, and at that time it was anticipated that prosperity would continue over the greater part if not over the whole of the period, but with the marked change in the outlook there have been complaints against the high price of steel.

Prices Deemed Too High

On the other hand, the manufacturer maintains that such a price is consistent with production costs, and that to lower the price to the consumer would mean the difference between loss and profit. Pig iron consumers were told in May that prices of forge and foundry iron had been stabilized to the end of the year. Here again there was considerable dissatisfaction with a policy that maintained prices even when trade activity was on the decline. Stability has also been the keynote in semifinished steel, wrought iron and scrap, where agreed prices were applicable throughout the year.

As already indicated, imports were unusually heavy during first quarter but since that time they dwindled considerably. The average monthly iron and steel imports during first quarter were 270,000 tons; during the next six months, imports fell to an average of 60,000 tons a month. In September, to take only

British Production Summary for 1938

(Gross tons 000 omitted)

	PRODUCTION				IMPORTS			EXPORTS		
Mo. ave.	Coal	Pig iron and ferro-alloys	Furnaces in blast‡	Steel ingots and castings	Iron ore	Pig iron and ferro-alloys	Steel†	Furnace coke	Pig iron and ferro-alloys	Steel†
1913	29,951	855	338	639	603	18.0	168	...	93.7	320
1935	18,519	535	102	822	379	10.7	85	132	13.2	180
1936	19,044	643	110	982	496	25.9	98	120	9.3	174
1937	20,099	708	133	1,082	590	60.2	110	138	13.9	201
1938										
Jan.	20,832	761	130	1,081	618	90.4	218	131	13.0	178
Feb.	20,099	693	124	1,058	623	81.6	149	121	7.9	149
Mar.	22,006	715	118	1,116	622	95.9	181	90	5.0	171
April	17,826	661	111	939	591	38.4	23	51	5.7	163
May	19,122	634	105	957	561	24.7	31	63	5.6	162
June	17,118	542	97	776	405	29.2	32	49	3.1	148
July	16,826	508	90	683	330	19.6	45	144	3.5	132
Aug.	17,049	443	81	659	344	11.7	39	136	4.2	131
Sept.	18,517	430	77	755	271	18.0	44	144	9.8	128
Oct.	19,500	469	76	855	299	11.0	41	144	13.1	146
Mo. av.	18,890	586	...	888	466	42.0	80	107	7.1	151

†Includes iron castings, but scrap excluded.
‡Average for 1913: On last day of year or month for subsequent figures.

one example, only 6845 tons of steel blooms and billets were imported, compared with some 45,000 tons in the September, 1937, and 29,000 tons in September, 1936.

In the ten months' total the figures are swollen by excessive imports of the first quarter. Even so, they do not reach the levels of previous years, so that, taking all iron and steel imports over a ten-month period, the 1938 total is 1,224,048 tons, against 1,482,462 tons in the corresponding period of 1937 and 1,298,352 tons for 1936. The trend is likely to continue in the downward direction unless trade recovery sets in early in the new year.

A more encouraging outlook is to be found in the export position, even although statistics make a poor showing. Shipments from the Tees ports in September showed a sharp increase in comparison with previous months. Exports of manufactured steel rose from 11,719 tons to 14,700 tons. Taking the exports for the ten-month period from all British ports, however, they are some 600,000 tons below the total reached in the corresponding period of 1937.

Taken in the aggregate, the result of the year's export trading, though it did not attain the level of 1937, compares favorably with the previous year, and this lends encouragement to the view that trade expansion in the export market, on which Britain is largely dependent, may not be delayed much longer.

During the year, decline in demand for constructional steel was marked. In January, specifications from constructional engineers and other buyers could be met only with difficulty, and often requests for prompt delivery were put off with a promise to supply a small quantity almost immediately and the remainder within a short time. This condition did not exist long, and by summer the pressure for steel had disappeared. It is estimated that some large steel works were operating at no more than 60 per cent of capacity in the autumn. Another factor which affected the steel industry was depression in the motor trade, which continued over most of the year and resulted in a restricted call for such materials as sheets and strip.

Firms concerned with light castings production were among those which had overestimated requirements for pig iron early in the year, with the result that heavy stocks accumulated at many foundries and particularly those supplying the building trade.

Furnacemen have held forge and foundry iron stocks despite the considerable reduction in active furnaces in the producing districts such as the Middlesbrough area, the Midlands and South Wales. These stocks, however, began to diminish by the middle of October and were much reduced by the year's close.

The rerolling industry, which a year before had en-

European Iron and Steel Export Prices, 1938

BRITISH PRICES IN POUNDS STERLING, PER GROSS TON

F. O. B. Ports of Shipment

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Pig Iron	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d
Foundry, No. 3, Middlesbrough	6- 0-0	6- 0-0	5-12-6	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0
Hematite, East Coast	7- 5-0	7- 0-0	6-10-0	6-10-0	6-10-0	6-10-0	6-10-0	6-10-0	6-10-0	6-10-0	6-10-0	6-10-0
Semifinished Steel												
Billets	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6	7-17-6
Wire rods	11- 5-6	11- 5-6	11- 5-6	11- 5-6	11- 5-6	11- 5-6	11- 5-6	11- 5-6	11- 5-6	11- 5-6	11- 5-6	11- 5-6
Finished Steel												
Standard rails	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6	10- 2-6
Merchant bars	12- 0-0	11-15-0	11-15-0	11-15-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0	11- 0-0
Structural shapes	10-12-6	10-12-6	10-12-6	10-12-6	10-12-6	10-12-6	10-12-6	10-12-6	10-12-6	10-12-6	10-12-6	10-12-6
Plates, ship, bridge and tank	11-11-3	11-11-3	11-11-3	11-11-3	11-11-3	11-11-3	11-11-3	11-11-3	11-11-3	11-11-3	11-11-3	11-11-3
Sheets, black, 24-gage	14-15-0	14- 0-0	14- 0-0	14- 0-0	14- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0
Sheets, galvanized, 24-gage corrugated	17-10-0	16-15-0	16-15-0	16-15-0	16-15-0	16-15-0	16-15-0	16-15-0	16-15-0	16-15-0	16-15-0	16-15-0
Hoops and bands	13-10-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0	13- 5-0
Plain wire, base	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0	19-10-0
Galvanized wire, base	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0	23- 5-0
Wire nails, base	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0	18-10-0
Tinplate, base box 108 pounds	1- 2-6	1- 2-6	1- 2-6	1- 2-6	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 0-3	1- 0-3
Ferromanganese—delivered Atlantic seaboard, duty-paid	$102.50	$102.50	$102.50	$102.50	$102.50	$102.50	$102.50	$92.50	$92.50	$92.50	$92.50	$92.50

CONTINENTAL PRICES IN GOLD POUNDS, PER METRIC TON

F. O. B. Channel or Northern Seaports

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Pig Iron	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d	£ s d
Foundry, Silicon 2,50-3.00	2- 9-0	2- 6-9	2- 5-0	2- 6-0	2- 1-9	1-18-0	1-18-0	1-17-0	1-17-6	2- 0-0	2- 2-0	2- 1-0
Basic bessemer	2- 9-9	2- 6-0	2- 4-6	2- 4-6	2- 4-6	1-17-6	1-16-0	1-14-0	1-15-0	1-17-6	1-18-6	1-18-6
Semifinished Steel												
Billets	5- 7-6	5- 5-0	5- 5-0	4-17-6	4-15-0	4- 5-0	4- 5-0	4-10-0	4-17-6	5- 0-0	5- 0-0	5- 0-0
Wire rods	5-17-6	5- 7-6	5- 2-6	5- 0-0	5- 2-6	5- 2-6	5- 2-6	5- 2-6	5- 2-6	5- 2-6	5- 2-6	5- 2-6
Finished Steel												
Standard rails	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0	5-15-0
Merchant bars	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 3-9	5- 3-9	5- 3-9	5- 3-9	5- 3-9
Structural shapes	5- 2-6	4-17-6	4-17-6	4-17-6	4-17-6	4-17-6	4-17-6	4-17-6	4-17-6	4-17-6	4-17-6	4-17-6
Plates 5 millimeters	6-12-6	6- 2-6	6- 2-6	6- 2-6	6- 2-6	6- 2-6	6- 2-6	5-17-6	5-17-6	5-17-6	5-17-6	5-17-6
Sheets, black, 24-gage, close-annealed	7- 0-0	6-17-6	7- 5-0	7-10-0	7-15-0	7- 5-0	7- 5-0	7- 7-6	7- 5-0	7-10-0	7-15-0	7-10-0
Sheets, galvanized, 24-gage, corrugated	10- 0-0	9- 5-0	8-17-6	9- 0-0	9- 0-0	8-17-6	8-15-0	8-12-6	8-15-0	8-17-6	9- 0-0	8-15-0
Hoops and bands	5-17-6	5- 7-6	5- 3-0	4-17-6	5-10-0	5-10-0	5-10-0	5-10-0	5-15-0	5-15-0	5-11-0	5-10-0
Plain wire, base	6-15-0	6-13-9	6-13-9	6-13-9	6-13-9	6-13-9	6-13-9	6-17-6	6-17-6	6-17-6	6-17-6	6-17-6
Galvanized wire, base	8-10-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0
Wire nails, base	7-17-6	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0	7- 5-0

countered inadequate soft billet and sheet bar supplies had more than sufficient semifinished steel over the greater part of the year. This industry in its turn has suffered from scarcity of orders, so that semifinished and rerolled stocks were heavy in all districts.

The shipbuilding industry fell off sharply and there are many empty berths on the Clyde and the Mersy, as indeed there are in all the important shipbuilding countries. New building has been postponed, according to a report issued by *Lloyd's Register of Shipping,* mainly because of the large increases in shipbuilding costs. These increases, due to wage advances and higher prices paid for materials, have also caused concern to shipbuilders, who, under present conditions, see no prospect of contracts being given out for ships to fill the berths emptied by the completion of the present shipbuilding programs.

War Activity not Relished

With the British government redoubling its armament efforts, it is probable that many calls will be made upon steel manufacturers in the near future. It is realized, however, that such a stimulus at best is artificial and cannot permanently aid industry. Moreover, it is not unlikely that heavy expenditure on armaments will tend to restrict private enterprise in other directions.

The international situation has undergone considerable improvement since the crisis, and, if this tendency continues one is satisfied that the British steel trade can find its feet in the future. With a friendlier atmosphere in Europe, confidence will be restored, but there can be little hope for even moderate trade revival without a better understanding between nations. There is a growing feeling, however, that with a prospect of peace on a more solid basis, there will come substantial recovery, not only in British industry, but in Europe generally.

Lowering of international trade barriers has been accomplished in some instances and this is a hopeful sign.

French Business Progress in 1938

(Metric tons 000 omitted)

	PRODUCTION*					IMPORTS			EXPORTS	
Mo. ave.	Iron ore	Coke†	Pig iron and ferr-alloys	No. furnaces in blast‡	Steel ingots and castings	Pig iron and ferro-alloys Coke		Steel§	Pig iron and ferro-alloys	Steel§
1913	3,588	336	756	195	581	256	4.2	10.0	9.0	51
1935	2,686	324	482	81	523	178	4.9	9.7	14.0	184
1936	2,767	327	520	83	559	213	5.8	7.7	13.5	149
1937	3,147	355	660	105	660	322	3.6	7.8	37.2	135
1938										
Jan.	3,267	365	643	101	623	298	4.1	4.0	64.0	154
Feb.	2,852	332	556	97	562	309	5.1	5.0	42.0	136
March	3,100	379	553	91	562	251	4.1	4.0	48.0	120
April	2,756	358	479	85	500	203	2.1	3.0	28.0	97
May	2,628	371	483	83	501	178	2.1	4.0	18.0	95
June	2,672	351	463	81	480	175	1.1	5.0	17.0	120
July	2,583	336	433	77	436	148	1.1	5.0	24.0	116
Aug.	2,541	319	419	77	419	160	1.2	1.0	29.0	136
Sept.	2,625	344	447	76	470	145	3.1	4.0	71.0	125
Oct.	2,633	373	494	82	512	151	1.3	3.0	54.0	129
Mo. av.	2,766	...	497	..	506	202	2.5	3.8	39.5	123

*Production for 1913 is for France in her present boundaries.
†Coke production at the coal mines. In addition, the iron and steel works produce about 3,000,000 tons annually.
‡On last day of year, or month.
§Includes ingots, semifinished steel, all rolled products, forgings and scrap.

French Output Shrinks Under Adverse Conditions

BY LEON JAUDOIN,
French Correspondent

■ THE best that can be said about the French iron and steel industry during 1938 is that it struggled through. Among the many unfavorable factors were obstacles met in application of the social laws instituted in 1937, difficulty of obtaining capital for development, monetary instability, continued increase in overhead charges, particularly social charges; and general recession of trade in France. These factors brought about a reduction in activities of iron and steel works, and in some cases a complete stoppage, with resultant unemployment.

More directly, the steel industry was hit by curtailment of the big public works program and, to some extent, also by a slump in housing construction which followed considerable increase in building costs. In the Paris district there was practically a complete stoppage in construction of large apartment or business buildings, and it was only in certain industrial districts that housing schemes for the workers were carried out.

In the country generally there was little incentive to buy, owing to the uncertain outlook in the political situation both inside and outside the country. Advantages derived from devaluation of the franc were only temporary, as devaluation was followed by higher costs of production. While the actual cost of living did not increase to a large extent, the index in respect of the cost of industrial products increased from 591 Dec. 31, 1937, to 672 at the beginning of November, 1938, and the index for ores and metals rose from 663 to 801. The moderate increase in cost of living itself hardly justified demands from labor for higher wages, but industry was, nevertheless, disturbed by strikes, mainly of a political nature or sometimes started on a pretext such as dismissal of a worker.

Better Labor Laws in Making

It was noticeable tnat in many cases the men themselves were not in favor of striking, and on occasions when a secret ballot was taken, the majority were in favor of resuming work. In view of constant disturbances caused to industry during the past two years by such strikes, legislative measures were being prepared at the end of the year to regulate the strike weapon and give a measure of protection to industrial management; other measures were being taken concurrently to preserve the rights of workers.

Toward the end of the year and following disruption of business brought about by the European crisis in September, the financial condition of France was critical and production generally was at a low ebb. To remedy the situation, strong measures were being devised by Premier Daladier, under the full powers given by parliament, to enable the country to return to its normal productive capacity, mainly by reverting to longer working hours and reorganizing the principal industries.

Before the year came to an end, the government had already succeeded in increasing the working

hours in the coal mines in order to stimulate production and reduce the necessity for France to import large quantities of coal.

During the year an attempt was made in the French iron and steel industry to make up for lack of buying in the domestic market by developing export trade, especially in view of the competitive prices at which French products could be offered, thanks to the devalued franc. The attempt, however, was not altogether successful, because the French steel industry could sell only the tonnages that were allowed by the quota fixed by the international comptoirs. In fact, there was a reduction, in comparison with 1937, in exports of semifinished steel, structural steel and merchant steel. The position began to improve only toward the end of September.

The main outlets for export business were Scandinavia, Finland and Holland, more particularly for rolled steel. The Argentine Republic was also an important buyer throughout the year, but India and South Africa bought only sporadically. In most overseas markets competition was encountered from the United States, and considerable interest is being taken in the negotiations that have been going on between American and European steelmakers with a view to arriving at some agreement on export prices and markets.

Great Britain was the largest purchaser of semifinished steel, although during second half exports to that country were considerably restricted, owing to the large stocks that had accumulated in Great Britain.

Normal Balance Is Disturbed

In the domestic market, business was more or less somnolent up to the beginning of September, when a slight revival became noticeable. An interesting feature of the domestic market was the fact that a large part of output was required for armament and defense. For this purpose demand was chiefly for open-hearth and special steels, and there was a corresponding reduction in the output of basic bessemer steel.

This destroyed the normal balance of operation in steelworks organized to make a relatively high proportion of basic steel. Consequently, some works did not receive sufficient orders for basic bessemer qualities to justify operating their furnaces, and many basic bessemer furnaces were closed down, thus reducing the supply of gas and by-products used throughout the works and interfering with general operation. As a result of these conditions, some works were operating only 30 hours per week, while others chose to close down for certain periods.

The depression in the French iron and steel industry is well illustrated by the figures of production, which for the first 10 months of the year were 5,065,000 metric tons of steel ingots and castings, and 4,970,000 tons of pig iron. These figures compare with 6,554,000 metric tons and 6,549,000 tons respectively in the corresponding period of 1937. It is estimated that for the whole year 1938 the steel output will attain 6,000,000 metric tons, a reduction of 3,700,000 tons in comparison with the record output in 1929, which reached 9,700,000 tons.

Output of rails was particularly low, and it is estimated that the French National Railroad corporation did not place more than 50 per cent of the orders usually received for track material in depressed years: this was due partly to necessity for reducing expenditure and also to the fact that many secondary railroad lines were replaced by motor coach services. Owing to the slump in construction, demand for structural steel also was low. Against this, there was a good market for ship plates, owing to development in requirements of the navy.

The following table gives, for the first seven months, the production of syndicated products, broken up as between deliveries in the domestic and export markets.

OUTPUT OF COMPTOIR-CONTROLLED PRODUCTS FIRST SEVEN MONTHS OF 1938

Metric tons

	Delivered to Domestic Market	Delivered to Export Markets	Total
Semifinished shapes	312,000	101,000	413,000
Structural steel	115,000	71,000	186,000
Merchant steel	476,000	70,000	546,000
Rails	144,000	27,000	171,000
Plates	141,000	15,000	156,000
Medium-gage sheets	69,000	3,000	72,000

In the next table, giving the periodical fluctuations of orders received by the syndicates, reduction in export demand for semifinished steel is particularly noticeable, due to the fact that Great Britain considerably reduced its purchases.

COMPARISON OF ORDERS BOOKED BY THE LEADING COMPTOIRS

Metric tons

	Mo. ave. 1936	Mo. ave. 1937	Mo. ave. 1st qrtr. 1938	July 1938	Aug. 1938	Sept. 1938	Oct. 1938
Semifinished steel							
Domestic	19,400	26,000	15,450	13,700	13,000	17,200	20,200
Export	29,200	29,300	14,125	12,700	13,250	14,600	17,800
	48,600	55,500	29,575	26,400	26,250	31,800	38,000
Structural shapes							
Domestic	20,550	15,500	12,600	9,950	9,800	11,100	11,750
Export	16,450	11,600	8,100	9,900	10,600	15,200	11,800
	37,000	27,100	20,700	19,850	20,400	26,300	23,550
Merchant bars							
Domestic	77,500	71,400	48,500	51,250	52,350	59,500	52,100
Export	20,550	18,800	8,800	14,800	16,900	24,800	23,400
	98,050	90,200	57,300	66,050	69,250	84,300	75,500

During the year the various syndicates functioned normally, and the wire rod syndicate received a new lease of life. Organization of the sheet syndicate, which was started at the end of 1937, was completed, and the quotas of the member-works were fixed in April. This syndicate controls both domestic and export sales, but only a limited number of works have an export quota, and there is some uncertainty as to the future of the syndicate, since one member-works had undertaken to maintain its membership only until Dec. 31, 1938.

The wire products syndicate, which had not been renewed for about 18 months, started again in June, 1938. This syndicate includes practically all manufacturers, and the few that remain outside are faced with difficult conditions. These various syndicates operate under the control of the Comptoir Siderurgique.

Owing to reduced business activities, deliveries were not unduly extended, and promises were usually kept by the works. Prices remained stable practically throughout the year, due to the policy of the price control committee, which applied the condition laid down by the government in June, 1938, that no increase in prices would be tolerated. The only modification was due to a slight increase in the production tax, which was raised in May from 8 per cent to 8.70 per cent. There was, however, an increase in the price of pig iron, which rose from 554 francs at the beginning of the year to 598 francs, the new

price applying only from the beginning of May.

Practically throughout the year the following basic prices were fixed, all per metric ton and for basic bessemer steel: Billets, 840 francs, merchant bars, 1080 francs; heavy beams, 1055 francs; bridge plates, 5 millimeters thick, 1350 francs; 2-millimeter sheets, close annealed, 1600 francs; hoops, 1210 francs; plain wire, 1600 to 1660 francs.

Few changes of importance were made in the principal works during the year. The installation of an important galvanizing shop by the Aplataer process was carried out at the works of Senelle-Maubeuge. On the other hand, an attempt is being made by the authorities to decentralize the various groups of production—presumably as a war-time precaution.

While activities of the French iron and steel industry during the greater part of 1938 were substantially restricted, certain signs of revival were apparent toward the end of the year and justify the hope that, if no further major crisis intervenes, production may return to a satisfactory level. On the other hand, the national financial situation is critical and still remained to be solved as the year came to an end.

Belgium, Luxemburg Face More Obstacles to Exports

European Staff Special

■ FOR countries like Belgium and Luxemburg, whose steel industry depends mainly on export business, 1938 was difficult, owing to the many disturbances in international transactions. In addition to the obstacles set up by certain countries that are endeavoring to become more and more self-contained, continuation of civil war in Spain and disturbed conditions in China exerted their detrimental influence.

Nineteen thirty-eight was, above all, notable on account of annexation of Austria by Germany and, still more, by the climax reached in September, when war was averted almost by a miracle.

All these disturbing events tended to restrict international trade and had a direct effect on Belgian and Luxemburg iron and steel production, which started to decline at the beginning of the year, when many transforming works were operating only part time.

Faced with this reduction in output, Belgium and Luxemburg were further troubled by keen competition exerted in overseas markets by the United States, and serious efforts were made to come to some arrangement with America through the European steel entente. Another factor which had a detrimental influence on Belgo-Luxemburg export trade was the tendency of certain countries, which hitherto had imported the greater part, if not all, of their steel requirements, to build up their own steel industry. In this connection, a new steelworks and rolling mill in Holland and rolling mills in Ireland are to be noted, as well as the increase in productive capacity taking place in Rumania. Competition from a new quarter, Manchuria, was also encountered, that country having sold pig iron to Great Britain and Germany.

All these factors united to reduce business volume in Belgium and Luxemburg during the first six months. However, toward July, market conditions began to show more activity, and improvement continued practically until the end of the year, except for the interruption during the critical international situation in September.

The most unsatisfactory feature at the end of the year was the fact that Great Britain, one of Belgium and Luxemburg's best customers, showed little inclination to resume purchases. Under these circumstances, it is not surprising that there was considerable reduction in iron and steel output, as indicated by figures covering the first ten months, which for Belgium amounted to 1,846,960 metric tons of steel ingots and castings, and 2,010,630 metric tons of pig iron, compared with 3,287,420 tons and 3,244,770 tons, respectively, in the corresponding months of 1937. During the same period, Luxemburg produced only 1,155,794 metric tons of steel and 1,219,908 tons of pig iron, against 2,172,400 tons and 2,168,130 tons.

Prices Seek Lower Level

As a result of reduced world demand for steel and competition between exporting countries, prices naturally followed a downward trend. In some cases prices were officially reduced by the comptoirs, but in many cases further reductions were made unofficially in the form of concessions or favored terms for the most interesting contracts.

This downward price tendency applied to the domestic as well as the export markets, and foundry pig iron, which was quoted at about 800 Belgian francs at the beginning, dropped to 500 francs at the end of 1938. The following table shows extreme price fluctuations for the principal steel products in the export markets, in gold pounds, f.o.b. Antwerp, the lower prices prevailing late in the year:—

EXPORT PRICE FLUCTUATIONS

Gold pounds per gross ton, f.o.b. Antwerp

Billets, 3 to 4-inch	£3 12 6 to £5 17 6
Structural shapes	4 10 0 to 5 6 6
Merchant bars	4 10 0 to 5 5 0
Hoops and bands	5 5 0 to 6 10 0
Wire rod	4 15 0 to 6 2 0
Plates	5 2 6 to 6 2 6
Black sheets, 24 B. G.	7 2 6 to 7 15 0
Galvanized corrugated sheets, 24 B. G.	8 10 0 to 9 10 0

Operation of the European steel entente and its subsidiary selling syndicates is of considerable im-

Belgian-Luxemburg Production in 1938

(Metric tons 000 omitted)

		PRODUCTION — Belgium		PRODUCTION — Luxemburg		IMPORTS Belgium and Luxemburg		EXPORTS Belgium and Luxemburg	
Mo. ave.	Coke	Pig iron and ferro-alloys	Steel ingots and castings	Pig iron and ferro-alloys	Steel ingots and castings	Pig iron	Steel*	Pig iron	Steel*
1913	294	207	206	212	98	48.0†	26.0†	1.4†	130†
1935	370	252	252	156	153	17.0	13.2	3.5	298
1936	378	263	265	166	166	23.3	19.1	5.2	303
1937	489	320	322	209	209	25.7	19.7	4.1	352
1938									
Jan.	489	260	229	144	132	11.9	7.7	7.0	254
Feb.	424	207	181	117	111	8.6	6.9	5.2	194
Mar.	429	193	175	113	109	7.8	8.2	15.1	189
April	373	174	160	114	109	8.2	7.9	5.8	151
May	367	177	162	115	111	8.7	8.5	3.8	169
June	362	192	180	113	110	6.7	6.1	6.1	155
July	372	199	185	118	110	9.4	7.8	14.7	170
Aug.	363	196	182	117	113	8.9	6.6	14.1	172
Sept.	356	197	187	119	117	9.7	6.3	16.4	176
Oct.	384	216	207	149	132	...	...	...	...
Mo. av.	392	201	185	122	115	8.9	7.3	9.8	181

*Includes iron castings and scrap.
†Belgium only.

portance to Belgium and Luxemburg, since these organizations control export trade. The comptoirs endeavored to prevent prices from falling too rapidly, but were unable to stop the concessions that were offered, more particularly by those transforming works and merchant concerns that have still retained some independence. The steel entente itself was renewed in June for a term expiring Dec. 31, 1940. This decision was not arrived at without serious discussions, as certain quotas had to be reduced.

The agreement between the British Iron and Steel federation and the entente also was maintained. An important activity of the cartel during the year was negotiation with the leading representatives of the American steel industry, meetings having taken place in Paris, London, New York and Belgium.

While a *modus vivendi* was arrived at, no definite or permanent results were obtained, but as the year came to an end, Continental producers were less troubled about American competition, owing to business improvement in the United States, which brought about a considerably increased demand for American steel from the home market. Among subsidiary comptoirs, that for tinplate was renewed for three years, and the wire rod comptoir until the end of 1940.

In regard to domestic trade in Belgium, it is interesting to note that the requirements for armament for national defence and the necessity to reduce production costs have resulted in increased demand for higher grades of steel: as a consequence, several electric furnaces were set up in certain Belgian works, and in both Luxemburg and Belgium, producing firms have endeavored to modernize their plant and equipment.

That 1938 was a year of slump is illustrated by the fact that the number of Belgian blast furnaces in operation fell from 47 Jan. 1 to 36 Oct. 31, out of a total of 63 existing furnaces, and exports of iron and steel, excluding scrap, from the Belgo-Luxemburg economic union in the first nine months dropped from 3,066,000 metric tons in 1937 to 1,760,000 tons in 1938.

The year ended on a more hopeful note, and with a tendency for production to revive, but the international situation and protective measures adopted by many countries, including Ireland and Turkey, continue a serious cause of anxiety. Difficulties due to monetary restrictions are also experienced in South American markets, which constitute one of Belgium and Luxemburg's principal outlets.

However, steelmakers are making considerable efforts to maintain their hold on these markets and also in northern Europe and the Far East, and it is hoped that by concerted efforts, not only among national producers, but also by means of co-operation with the representatives of the steel industries of other countries, 1939 will be more favorable than the past year.

German Business Progress in 1938

(Metric tons 000 omitted)

	PRODUCTION*				IMPORTS‡		EXPORTS‡		
Mo. ave.	Coke	Pig iron and ferro-alloys	No. furnaces in blast†	Steel ingots and castings	Pig iron and ferro-alloys	Steel§	Coke	Pig iron and ferro-alloys	Steel§
1913	2,639	1,024	225	1,166	11.0	41	534	71.0	470
1935	2,486	1,070	108	1,357	8.2	68	550	19.1	249
1936	2,988	1,275	114	1,578	11.5	59	599	22.1	284
1937	3,408	1,330	125	1,651	15.0	77	733	9.6	298
1938									
Jan.	3,614	1,438	126	1,812	18.4	130	584	5.4	266
Feb.	3,300	1,349	129	1,770	17.2	135	509	4.0	213
March	3,655	1,539	133	1,972	30.8	154	456	5.4	219
April	3,487	1,480	137	1,818	25.4	129	326	4.6	201
May	3,646	1,595	139	1,963	16.9	144	375	5.3	222
June	3,545	1,555	139	1,890	17.2	91	408	4.5	233
July	3,670	1,625	142	1,981	29.4	91	498	4.9	225
Aug.	3,704	1,585	141	2,018	20.7	136	443	4.6	224
Sept.	3,592	1,541	139	1,984	48.7	143	428	6.7	210
Oct.	3,771	1,611	143	2,057	65.8	102	437	6.5	238
Mo. av.	3,598	1,532	...	1,927	29.0	125	446	5.19	225

*Figures for 1913 are for Germany in her present boundaries, but without Austria. Figures include Austria as from March 15, 1938.
†On last day of year, or month.
‡Figures for 1913 are for pre-war boundaries and include Luxemburg.
§Includes iron castings and scrap.

Germany Attains Record; Further Progress Planned

BY DR. HANS HARTIG, VIENNA
Special Correspondent

■ IN SPITE of the fact that the Hermann Goering works, started in 1937, have not yet been able to produce at full rate, the record output of the German steelworks in 1937 was exceeded in 1938 by more than 3,000,000 tons.

Existing iron and steel works of Germany have carried out the tasks that fell to them under the four-year plan in a satisfactory manner. The considerably increased output of the German steel industry in 1938 is of particular interest in view of the fact that its achievement was not, for the most part, assisted by supplies of ore from the new German ore-producing districts, which are still in process of being opened up, but was made possible only by increased use of scrap. This also explains why the average monthly output of open-hearth steel in 1938 comprised 52.3 per cent of total production, while the output of basic bessemer steel was 40 per cent.

In the latter half of 1938, however, owing to a steady advance in the mining and smelting of German low-grade iron ores, a certain shift in favor of basic bessemer steel may be noticed again. Moreover, as a result of introduction of the liquid pig iron charge in the open-hearth process, the ore charge has in reality been higher in past years than one would imagine from the foregoing comparison of the relative figures for the two most important processes.

It is estimated that in a few years' time 30 million tons of German low-grade iron ores will be mined, and their utilization will make further big demands on the German coalmining industry, which for its own part can already show an increase in output of coal and production of coke. The progress made by Germany's iron ore mining industry is illustrated by the fact that in the first nine months of 1938 the extraction of convertible ore from the mines was 8,170,000 metric tons, against 6,100,000 tons in the corresponding period of 1937. The number of miners employed had, of course, to be increased proportionately, especially as in many of the new ore-producing regions preliminary work was often necessary in opening up new mines.

The coal and lignite mining industry and the coke industry also showed an increase over the previous year in tonnage mined and manufactured during the

first nine months of 1938. Output of coal was 139,159,100 metric tons, or 3,000,000 tons more than in the first nine months of 1937, and production of metallurgical coke, at 32,212,300 tons, showed an increase of nearly 2,000,000 tons.

Since, however, with the progress of hydrogenation and rapid development in the smelting of German low-grade iron ores present production of coal and coke will soon be insufficient to meet the demand, new shaft installations are now being carried out, and new central coking plants built.

Production figures for blast furnaces and steelworks for the first nine months of 1938 are given in the accompanying table.

In the first ten months, Germany produced 15,315,456 metric tons of pig iron and 19,265,159 tons of raw steel. These figures include 457,502 tons of steel and 353,786 tons of pig iron produced in Austria since March 15. The figures compare with 13,185,448 tons of pig iron and 16,292,658 tons of steel in the first ten months of 1937.

In spite of increased production, demand for iron and steel in Germany again could not be met in 1938. It was not only impossible to relax the quota system introduced in May, 1937, but necessary to extend it in the spring and autumn of 1938 to the regions that were then reunited with the Reich, Austria and the Sudetenland.

Austria Brought Much Ore

The reunion of Austria with the German Reich has meant, above all, a considerable increase in sources of ore available for the German iron industry. The famous Styrian ore mines alone contain over 500 million tons of high-grade iron ores which are almost free from impure elements and are, therefore, particularly suitable for the manufacture of high-grade steel. In addition, there are the Huttenberg ore mines in Carinthia. The output of ores in the Ostmark (Austria) amounted to over 3,000,000 tons in 1938, compared with 1,900,000 tons in the previous year and 1,000,000 and 500,000 tons in 1936 and 1934 respectively.

Moreover, a large new steelworks is being built at Linz, on the Danube, by the Hermann Goering Reich Corp., which will be capable of producing 1,000,000 tons of raw steel, and will have its own harbor, a coke plant and a constructional department. There in Linz, coal coming by water from the Ruhr, along the Rhine-Main-Danube canal, will be washed, and there, too, alongside, or rather with, the rich ores from the Styrian ore mines will be smelted the low-grade "Dogger" iron ores from the Franconian Jura, also transported on the Danube.

The effect of these new works, with various improvements in the plant of the Oesterreichisch-Alpinen Montangesellschaft (which will probably be amalgamated with the Reich works) and some new premises opened by the Gebr. Bohler & Co.., A. G., and the Schoeller-Bleckmann steelworks, A. G., two important high-grade steel producers, will be to bring the annual figure for the production of raw steel in the Ostmark (Austria) up to 2,000,000 tons. Near the Reich works at Linz a sheet billet mill is to be built having an annual production capacity of 500,000 tons, which will supply the sheet mills of the Rottenmanner Eisenwerke, A. G., which are to be removed to Linz.

As a result of reincorporation of the Sudetenland in the German Reich in the autumn of 1938, Germany's production of tubes was increased, for now the Mannesmann Tube Works, A. G., in Komotau, where 6000 men are employed, are in German territory. In the same Sudeten-German town of Komotau are the steelworks and foundry of the Poldihutte, as well as a zinc works, all of which became part of the German industry. Apart from these, the industry's acquisitions are hardly worth mentioning, comprising, as they do, only three smaller Sudeten-German works, a rolling mill, a forge and a foundry.

Foreign Trade Is Unfavorable

Foreign trade returns of the German iron and steel industry for the first three-quarters of 1938 are less favorable than those for the corresponding periods of 1937 and 1936. While Germany's exports were less than those of the previous year, her imports showed a large increase. The excess of 926,300 tons shown by exports over imports for the first nine months of 1938 represent a reduction of 872,000 tons, or almost half, if compared with the previous year.

Values, on the other hand, were better maintained, which indicates Germany's efforts to export high-grade products. In view of the shortage of iron and steel in Germany, which has resulted from the continued economic revival, export of semifinished products in particular was restricted, and the import of those products increased. Exports of tubes and permanent way material for railroads held well.

Viewed as a whole, the German iron and steel industry can be said to be advancing toward a period of high achievement. As a result of the large program of road and industrial construction (new works, motor-roads, canals, railroads in the recovered districts), and also because of the serious house-shortage (about 3,000,000 new dwellings are needed in Germany), the consumption of steel in Germany is steadily increasing. In 1933, average consumption per month per head of the German population was 8.6 kilograms; the corresponding figures for the following years increased to 14.8, 17.6, 20.1 and 21.7 kilograms, reaching even 25 kilograms in the first half of 1938.

In a few years, when plants of the Hermann

PRODUCTION BY GERMAN INDUSTRY
Metric tons

	Pig iron		Raw steel		Finished Products	
Month	1937	1938	1937	1938	1937	1938
January	1,292,100	1,437,700	1,534,000	1,812,300	1,085,300	1,240,000
February	1,190,800	1,348,600	1,519,500	1,770,200	1,097,500	1,219,300
March	1,303,900	1,521,200	1,581,700	1,948,600	1,136,000	1,377,800
April	1,306,200	1,442,400	1,644,700	1,765,600	1,195,600	1,225,400
May	1,313,100	1,545,000	1,658,100	1,896,800	1,097,500	1,330,100
June	1,304,200	1,508,500	1,656,600	1,889,700	1,203,400	1,336,800
July	1,345,300	1,625,400	1,654,200	1,981,100	1,183,300	1,408,400
August	1,361,600	1,584,800	1,662,700	2,018,100	1,187,600	1,457,500
September	1,349,500	1,540,500	1,690,400	1,983,700	1,222,800	1,417,100
TOTAL	11,766,700	13,554,100	14,601,900	17,066,100	10,409,000	12,008,500

Goering Reich works in Helmstedt, near Brunswick, and in Linz, will be working, the German steel industry should be producing from 27 to 28 million tons of raw steel. It is probable that the quotas, restrictions on consumption, and bans on certain uses affecting iron and steel materials in Germany will then be lifted, and German industry will be able to play a bigger part in international trade than it is already doing.

Central European Steel Industry Is Realigned

BY DR. JAN TILLE,
Special Correspondent

■ STEEL production in various Central European countries cannot be judged as in previous years. Political events have influenced manufacturing and sales possibilities in such a way that territorial changes must be taken into consideration.

Austria was annexed to Germany in March, steelworks were taken over by the Reich and their production figures included in German statistics as from March 15. Practically the whole pig iron output and about 75 per cent of the steel output of Austria are produced by one concern, the Alpine Montangesellschaft, which also owns the greater part of the iron ore mines. Total steel output in Austria in 1937 was 650,000 metric tons. For 1938, under more intensive productive methods, the output can be estimated at about 700,000 tons.

Later in the year, Czechoslovakia lost considerable territory to Germany, Poland and Hungary. This involved transfer of numerous metallurgical works, mainly to Poland and Germany, which took place at the end of September. In the circumstances, Czechoslovak industry displayed great endurance, shown by production statistics of numerous industries. Steelworks and the machinery industry in particular carried out large deliveries for the home market as well as for export.

In comparison with the previous year, iron and steel production declined a little, but if it is taken into consideration that 1937 was a record year, this decline was not unexpected. In the first nine months of 1938, Czechoslovakia produced 1,470,600 metric tons of raw steel, compared with 1,700,000 tons in the corresponding period of the preceding year, 13.5 per cent less.

At the end of September the political situation reached such a point that a general mobilization was proclaimed and war seemed inevitable. Czechoslovakia was forced to cede the Sudeten territory to Germany and to accept territorial cessions to Poland and Hungary.

As a result steelworks of the Mining & Iron Works Co., with a plant at Trinec, and the Albert Hahn works, were transferred to Poland. Germany gained the steel concern of Most. In the Czechoslovak steel cartel, these works had the following quotas: Trinec, 24.1 per cent; Hahn, 5.3 per cent; Most, 2.8 per cent.

Owing to fewer steelworks in Czechoslovakia, and the fact that a political revolution always brings about a reduction of trade, the last quarter output showed considerable decrease. Czech steel trade will be adversely affected, since the loss of territory and inhabitants in western Czechoslovakia alone is about 25 per cent.

Exports of Czechoslovak works nearly reached the level attained in the previous year, about 20 per cent of production. Domestic prices of rolled material remained unchanged, being completely stabilized since November, 1931. Iron ore was again imported from Sweden, Yugoslavia and Bulgaria. Business relations with Soviet Russia almost ceased, both in imports of iron ores from Russia and deliveries of rolled material to Russia.

Because several former Czechoslovak steelworks are now in foreign territory, it will be necessary to change the Czechoslovak relationship with the international steel cartel. Furthermore, it will be necessary to revise its participation in the selling organizations for merchant bars, hoops and bands, black and galvanized sheets, plates and medium gage sheets. The Czechoslovak works continue to be members of the International Rail Makers' association.

Steel production in Czechoslovakia is concentrated at Vitkovice and Kladno. These works can supply the entire consumption of new Czechoslovakia and considerable export tonnage. Even in its present mutilated form, Czechoslovakia remains a vital unit, and is determined to regain its former prosperity.

In Poland, raw steel output during the first nine months reached about 1,100,000 metric tons. Because the Trinec steelworks, which in 1937 produced 560,000 tons of raw steel, are now in Polish territory, the situation will, of course, change considerably. Polish works are organized in a syndicate which fully controls the Polish domestic market, and there would appear to be no place for new works in the home market and, consequently output of the Trinec works will be almost exclusively for export, which will affect Poland's participation in the international steel cartel.

Poland's Steel Sales Growing

Steel sales in Poland during past years have been growing, the industry is still developing, and it is, therefore, to be expected that Poland will continue to take a more important part in the steel industry of Europe. This will inevitably result in increased quotas in the international cartels EIA and IRMA. The State of Poland has a participation in the largest Polish iron and steel works, and subsidizes the export trade by allowing export premiums. In addition to the Trinec works, Poland has also acquired the Oderberg wire mills, owned by the Trinec concern, and the Hahn tube works.

Hungary in 1938 had also about the same raw steel production as in the previous year, 324,000 metric tons for first half, compared with 660,000 tons for all of 1937. Hungary remains a member of the IRMA (rail makers' association), but the negotiations of the EIA (International steel entente) with the Hungarian steel industry have not yet been successful. Domestic prices remained unchanged.

Steel production in Russia was greater than in 1937, about 18,000,000 metric tons, about 10 per cent less than the government quota, according to reports. New blast furnaces and steelworks have been erected, in addition to various rolling mills and engineering works. Exports of iron and steel to western European markets were restricted, but substantial tonnages were sold to China.

Scrap Crucial Factor In Italian Situation

BY DR. GUIDO VANZETTI,
Special Correspondent

■ INTENSE activity marked operations of the Italian iron and steelworks during 1938. Notwithstanding restrictions on consumption of steel imposed by the official organization responsible for the manufacture of armaments (COGEFAG), output of raw steel for the first 10 months at 1,946,273 metric tons was about 9 per cent higher than in the corresponding period of 1937, at 1,785,870 tons. There was, however, a decrease of about 12,000 tons in the output of steel for October, 1938.

Owing to the fact that the COGEFAG organization somewhat reduced its requirements toward the end of the year, surplus production was utilized either to complete delivery on past contracts or to increase exports of finished products. It was expected that for the year exports of steel products from Italy would exceed the 100,000 tons that had been foreseen at the beginning.

Pig iron being of considerable importance in the economic structure of Italy, there was practically no restriction on production of that material, and the mineral resources of the country were exploited to the full, with the use of concentrated pyrites, of which Italy has a a large supply. For the first 10 months the pig iron production was 722,225 metric tons, against 650,823 tons in the corresponding period of 1937. Again, as regards pig iron, there was a slight reduction of output in October amounting to about 3000 tons.

The question of scrap is of considerable importance to the Italian iron and steel industry, and throughout 1938 the position in regard to scrap showed considerable improvement. The forecast of the Consorzio Nazionale Approvvigionamenti Materie Prime Siderurgiche (CAMPSIDER), the official organization for the supply of raw materials to the steel industry, indicated that while supplies of scrap from foreign sources might not quite come up to the tonnages expected, they would be sufficient not only to meet requirements of the industry, but, in fact, to constitute an increase in the reserves of this raw material to start the new year.

Imports Limited by Government

State control was exerted during the year on imports of material into Italy, by the special department responsible for the maintenance of Italian currency and also by the COGEFAG or department responsible for the manufacture of armaments. Imports of nonferrous metals, such as copper, tin, nickel, were limited to the strict minimum; but a sufficient tonnage of those raw materials which are essential to the national industry and are not obtainable in the country was allowed to enter. All measures were taken to stimulate exports of finished steel products, particularly wire products and tin plate.

Following reduction in iron and steel prices that took place in world markets, prices in the Italian domestic market also tended downward. Iron and steel prices in Italy are controlled by the Nuova Unione Siderurgica Italiana (NUSI), the Italian steel union. The following quotations afford an idea of the reduction in prices: ordinary steel billets, from 1205 to 1145 lire per metric ton; merchant bars, from 1245 to 1185 lire; structural steel, from 1295 to 1235 lire. The Italian market for iron and steel products is controlled by the steel union (NUSI) and a number of syndicates for plates and sheets and tin plate, wire products, tubes, nuts and bolts, ferroalloys.

Another organization has been founded, the Consorzio Nazionale Approvvigionamenti Materie Prime per Fonderia (CAMPFOND), which controls the purchase and distribution of scrap for use in gray iron foundries.

A further step in organization of the iron and steel industry was made in June, 1938, when a new organization was set up, the Ente Distribuzione Rottami, with head office in Rome, to purchase and allocate among steel producers all the pig iron and steel scrap required by the industry, the allocation being made on the basis fixed by the committee responsible for the manufacture of armaments. No works which is a member of the organization is allowed to purchase its supplies of iron or scrap outside the organization, and no works is allowed to resell any surplus scrap that it may have accumulated. Actually, the manner in which these materials are allocated to the steelworks allows the armaments committee to control production according to plan.

Control Material Allocation

For this purpose the steelworks have been divided into two groups. The A group comprises those works that are considered actually or potentially as "integrated works," using their own ores and recuperating their by-products, thus effecting a complete cycle. Group B comprises the works which are not integrated and are compelled to use a relatively high proportion of scrap as raw material. The allocation of scrap to those works constituting group A will be gradually reduced as they become more and more self-contained.

Steelworks in group A will be allowed to use their own scrap, provided that they do not add more than 10 per cent scrap in their charges, and that, only when the annual output of Italian steel will have reached the tonnage according to plan. Any surplus scrap will be placed at the disposal of the new organization, the Ente Distribuzione Rottami.

Allocation of pig iron and scrap to steelworks belonging to group B will be made on the basis of a certain quota of production that will be fixed by the committee in charge of the manufacture of armaments.

Although this review deals mainly with the Italian iron and steel industry, it is of interest to note the considerable developments made in production of aluminum. Italy has considerable resources in that direction, and the output of aluminum in October, 1938, was 22,464 metric tons. The output for the year 1937 was 44 per cent more than in 1936 and 70 per cent more than in 1932. Developments also have taken place in regard to magnesium, and steps are being taken to stimulate production and use of aluminum and magnesium alloys. Measures for increasing production of these light alloys are subsidiary to the more important problem of stimulating production of iron and steel.

Mirrors of Motordom

(*Concluded from Page* 164)

with its superfinishing process for producing fine surface finishes by abrasive methods.

■ MARKETS: Faced with tobogganing sales, manufacturers early in the year took steps to readjust prices and bolster lower price lines. It soon became apparent the bottleneck was in used cars which were choking dealers into slow death. So in March the first joint industry campaign to move 700,000 used cars was sprung and an advertising expenditure of $1,250,000 was poured into newspapers and magazines over a one-week period. Results were conspicuously successful.

Meanwhile production of new cars was being curtailed sharply and by July when runs on 1938 models were being concluded evidence was building up that a shortage of new cars was developing. So urgent did the demand from dealers become with one company that production schedules for 1939 models were moved up a full month. Others advanced starting dates by two weeks, ten days, and by the time of the national automobile shows in November plants were hard pressed to keep dealers supplied with cars.

Prices on 1939 models were trimmed generally, and in addition numerous extras were included in list prices where formerly they brought an added charge. Automobile prices, incidentally, while they are now about on a par or somewhat above the 1937 model level, follow commodity prices closely.

A further interesting commentary on markets and automobile buying is the fact that 57 per cent of all auto sales are made to the upper 10 per cent of income groups, that is, those persons with incomes over $2600 annually.

■ PLANTS: Building activity among motor and accessory plants continued apace during 1938. Probably the largest single expenditure for new construction was the $34,000,000 earmarked by Ford. A large tool and die shop, a huge new press and body plant, a half-million dollar refurbishing of foundry facilities, rebuilding and enlarging of open-hearth furnaces, expansion of rolling mill facilities and extension of power and service tunnels were a few of the projects making up this expenditure.

General Motors completed its new diesel engine plant here and is now producing four intermediate sizes of two-cycle engines for nonautomotive power uses. Buick released contracts for a new service and parts building at Flint, involving close to $1,000,000. A new engine plant at Pontiac for General Motors Truck was equipped at a cost of about $1,000,000. A new 20-acre body hardware plant at Trenton, N. J., was completed by the Ternstedt division of GM.

Chrysler started operations in a new engine plant in Windsor, Ont., Dodge completed a $3,000,000 truck assembly and export plant on the outskirts of Detroit.

Briggs Mfg. Co. completed a new $3,000,000 body parts and plumbing ware plant near the Dodge plant.

Rotary Electric Steel Co. began construction of a new melt shop, to house an additional electric furnace and auxiliary equipment, the project calling for expenditure of about $750,000.

Great Lakes Steel Corp. put in operation four new 150-ton open-hearth furnaces, bringing its present battery to 16, brought in a new third blast furnace and a new battery of by-product coke ovens. Continuous sheet galvanizing equipment also was placed in production by this interest.

McLouth Steel Corp. completed a $500,000 addition to rolling facilities for cold-rolling and skin passing operations.

■ LABOR: While there was no repetition of the serious strike outbreaks of 1937 in automobile plants, the year was anything but calm laborwise. Chief obstacle which faced the United Automobile Workers was the virtual exhaustion of its treasury resulting from the inability of members to pay dues because of idleness. To correct this situation, resort was made to "dues drives" at regular intervals, and in many cases interruption to production developed.

Early in the year extensive layoffs were necessary in the ranks of auto workers. General Motors was compelled to release 30,000; others proportionately. Those remaining at work had some weeks as little as two or three days of employment. Two paths were open to employers—work as many men as possible on restricted schedules, or give more hours to a restricted working force. The first plan gradually gave way to the second when it became evident there was not enough work to guarantee living wages to the larger working forces. The UAW ultimately capitulated to the second plan and many of its members were forced onto WPA or relief.

In the fall, as employment picked up, the UAW brought pressure to bear in the interests of rehiring laid-off workers before extending the work week beyond 32 hours. Sporadic outbreaks of short-lived strikes developed on this score, but in the interests of plant efficiency, managements were of the opinion the 40-hour week was more advisable.

By December, the Detroit employment index had climbed to 97.6, compared with 100 for the period 1923-25, so the rapid upturn in business was gradually taking care of reabsorbing workers into plants without the necessity for trimming the work week.

As a progressive step in industrial relations, General Motors in November announced two income-security plans whereby in periods of layoffs employes could borrow certain percentages of their normal wages, repaying these amounts by subsequent work. Now in the mill is a further plan which will permit salaried employes to do likewise.

■ THIS review perhaps should not be concluded without a look ahead to what is in store for the motor industry. Already mentioned is the belief that future production will be based on a normal level of 3,700,000 cars and trucks annually.

Not mentioned is the fact that decentralization of operations away from Detroit is being continued by the large manufacturers, which will mean a further reduction in the 70 per cent figure which is estimated as the proportion of new cars now emanating from Michigan plants.

The so-called "big three" producers now supply almost 90 per cent of all production; the others must fight for what is left. Official figures for ten months of 1938 show General Motors accounting for 40.36 per cent, Ford 26.66 per cent and Chrysler 20.11 per cent of car and truck production.

(The current automobile production figures and comparisons that customarily accompany this department will be found in the late news section of this issue.)

Steel Output Set For Early Upturn

Gradual Recovery In Demand Expected For January

■ STEEL market activity is poised for a rebound this week, following a seasonal letdown over the holiday period.

Full recovery of operating losses sustained the past two weeks will not occur immediately, but gradual improvement in both production and sales is indicated through January.

Christmas observance largely was responsible for last week's drop of 12 points to 40 per cent in the national operating rate. While this marked a reduction of 21 points since early December, the rate remained well above the average for the first six months of 1938.

Total production of bessemer and open-hearth steel ingots in 1938 was about 28,000,000 gross tons. This places the year ahead of 1931, 1932, 1933 and 1934 but substantially below the output of any other year since 1921. The decrease from 1937 production was 43.5 per cent. Second half of 1938 showed a decrease of only 17 per cent from the corresponding 1937 period, indicative of the sharp recovery in steelmaking the past six months.

Demand for steel products was affected in varying degree by year-end influences. Structural shapes and concrete reinforcing bars continued active under the stimulus of construction programs, mostly government-financed. Bookings of such products to a large extent offset the falling off in spot demand from buyers who were attempting to curtail inventories. Shipments out of warehouse stock in December were maintained considerably better than anticipated.

Expect Early Replenishment Of Stocks Of Some Products

Consumer inventories of certain products are unusually low and are expected to be replenished soon. In a few items, principally sheets and strip, some tonnage remains to be shipped against orders placed several months ago at price concessions, and a general upturn in new business is not looked for until late January.

In contrast to the quiet common to the structural market at this period, awards the past week continued heavy. Principal orders included 5000 tons for an Ohio river bridge, Owensboro, Ky.; 5000 tons for a bridge, Stratford-Milford, Conn.; 4180 tons for a gun assembly shop, Washington; 1550 tons for a courthouse, Garden City, Long Island, N. Y.; and 1300 tons for a bridge, Kansas City, Kans.

Most automotive plants continue on a four-day week. Assemblies the next two months will be moderately below the November-December rate, but care exercised in avoiding accumulation of excessive stocks likely will prevent a sharp drop in first quarter production, such as occurred a year ago. Renewed steel buying by automotive interests is in prospect soon.

Mills Await Plans To Aid Railroad Equipment Buying

Outcome of plans designed to facilitate purchasing of railroad equipment and material will be a factor in determining the extent of business in rails, accessories and car and locomotive parts this year. Mills have a fair volume of railroad orders for early 1939 rolling, and the outlook for substantially more will be improved if suitable financing can be arranged.

The steel industry enters 1939 with prices steadier than in many months past. Stronger markets in reinforcing bars, merchant wire products and bolts and nuts contribute to the general stability.

Last Monday's holiday helped to bring steel production down 14 points to 26 per cent at Pittsburgh, 10.5 points to 46 per cent at Chicago, 3 points to 29 per cent in eastern Pennsylvania, 9 points to 50 per cent at Wheeling, 5 points to 77 per cent at Birmingham, 25 points to 50 per cent at Cincinnati, 9 points to 42.5 per cent at St. Louis, 11 points to 79 per cent at Detroit, 4.5 points to 39.5 per cent at Buffalo, and 13 points to 32 per cent at Youngstown. Cleveland was unchanged at 51, with New England holding at 70.

Scrap prices are steadier in most districts, but a reduction in eastern Pennsylvania on export business lowers the scrap composite 4 cents to $14.79 and the iron and steel composite 1 cent to $36.36. The finished steel composite is unchanged at $56.50.

COMPOSITE MARKET AVERAGES

	Dec. 31	Dec. 24	Dec. 17	One Month Ago Nov., 1938	Three Months Ago Sept., 1938	One Year Ago Dec., 1937	Five Years Ago Dec., 1933
Iron and Steel	$36.36	$36.37	$36.38	$36.39	$36.48	$38.88	$31.01
Finished Steel	56.50	56.50	56.50	56.68	57.20	61.70	51.10
Steelworks Scrap..	14.79	14.83	14.83	14.58	14.23	13.24	10.12

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Dec. 31, 1938	Nov. 1938	Sept. 1938	Dec. 1937
Steel bars, Pittsburgh	2.25c	2.25c	2.25c	2.45c
Steel bars, Chicago	2.25	2.25	2.25	2.50
Steel bars, Philadelphia	2.57	2.57	2.57	2.75
Iron bars, Terre Haute, Ind.	2.15	2.15	2.15	2.35
Shapes, Pittsburgh	2.10	2.10	2.10	2.25
Shapes, Philadelphia	2.215	2.215	2.215	2.465
Shapes, Chicago	2.10	2.10	2.10	2.30
Plates, Pittsburgh	2.10	2.10	2.10	2.25
Plates, Philadelphia	2.15	2.15	2.15	2.445
Plates, Chicago	2.10	2.10	2.10	2.30
Sheets, hot-rolled, Pittsburgh	2.15	2.15	2.15	2.40
Sheets, cold-rolled, Pittsburgh	3.20	3.20	3.20	3.55
Sheets, No. 24, galv., Pittsburgh	3.50	3.50	3.50	3.80
Sheets, hot-rolled, Gary	2.15	2.15	2.15	2.50
Sheets, cold-rolled, Gary	3.20	3.20	3.20	3.65
Sheets, No. 24, galv., Gary	3.50	3.50	3.50	3.90
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.90
Tin plate, per base box, Pitts.	$5.00	$5.10	$5.35	$5.35
Wire nails, Pittsburgh	2.45	2.45	2.45	2.75

Semifinished Material

Sheet bars, open-hearth, Youngs.	$34.00	$34.00	$34.00	$37.00
Sheet bars, open-hearth, Pitts.	34.00	34.00	34.00	37.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	37.00
Wire rods, No. 5 to $\frac{9}{32}$-inch, Pitts.	43.00	43.00	43.00	47.00

Pig Iron

	Dec. 31, 1938	Nov. 1938	Sept. 1938	Dec. 1937
Bessemer, del. Pittsburgh	$22.34	$22.34	$21.34	$25.26
Basic, Valley	20.50	20.50	19.50	23.50
Basic, eastern, del. Philadelphia	22.34	22.34	21.34	25.34
No. 2 foundry, Pittsburgh	22.21	22.21	21.21	25.21
No. 2 foundry, Chicago	21.00	21.00	20.00	24.00
Southern No. 2, Birmingham	17.38	17.38	16.38	20.38
Southern No. 2, del. Cincinnati	20.89	20.89	19.89	23.89
No. 2X, del. Phila. (differ. av.)	23.215	23.125	22.215	26.215
Malleable, Valley	21.00	21.00	20.00	24.00
Malleable, Chicago	21.00	21.00	20.00	24.00
Lake Sup., charcoal, del. Chicago	28.34	28.34	28.34	30.24
Gray forge, del. Pittsburgh	21.17	21.17	20.17	24.17
Ferromanganese, del. Pittsburgh	97.77	97.77	97.77	107.49

Scrap

Heavy melting steel, Pittsburgh	$15.75	$15.15	$15.25	$13.40
Heavy melt. steel, No. 2, E. Pa.	13.25	12.75	12.75	13.13
Heavy melting steel, Chicago	13.75	14.20	13.60	12.40
Rails for rolling, Chicago	17.75	17.40	17.75	14.25
Railroad steel specialties, Chicago	16.00	16.10	16.60	15.75

Coke

Connellsville, furnace, ovens	$ 3.75	$3.75	$3.75	$4.30
Connellsville, foundry, ovens	5.00	5.00	5.00	5.25
Chicago, by-product fdry., del.	10.50	10.50	10.50	11.00

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. cars.

Sheet Steel

Hot Rolled

Pittsburgh	2.15c
Chicago, Gary	2.15c
Cleveland	2.15c
Detroit, del.	2.25c
Buffalo	2.15c
Sparrows Point, Md.	2.15c
New York, del.	2.39c
Philadelphia, del.	2.32c
Granite City, Ill.	2.25c
Middletown, O.	2.15c
Youngstown, O.	2.15c
Birmingham	2.15c
Pacific Coast points	2.65c

Cold Rolled

Pittsburgh	3.20c
Chicago, Gary	3.20c
Buffalo	3.20c
Cleveland	3.20c
Detroit, delivered	3.30c
Philadelphia, del.	3.52c
New York, del.	3.54c
Granite City, Ill.	3.30c
Middletown, O.	3.20c
Youngstown, O.	3.20c
Pacific Coast points	3.80c

Galvanized No. 24

Pittsburgh	3.50c
Chicago, Gary	3.50c
Buffalo	3.50c
Sparrows Point, Md.	3.50c
Philadelphia, del.	3.67c
New York, delivered	3.74c
Birmingham	3.50c
Granite City, Ill.	3.60c
Middletown, O.	3.50c
Youngstown, O.	3.50c
Pacific Coast points	4.00c

Black Plate, No. 29 and Lighter

Pittsburgh	3.05c
Chicago, Gary	3.05c
Granite City, Ill.	3.15c

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.95c
Pacific Coast	4.65c

Enameling Sheets

	No. 10	No. 20
Pittsburgh	2.75c	3.35c
Chicago, Gary	2.75c	3.35c
Granite City, Ill.	2.85c	3.45c
Youngstown, O.	2.75c	3.35c
Cleveland	2.75c	3.35c
Middletown, O.	2.75c	3.35c
Pacific Coast	3.35c	3.95c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 304
Bars	24.00	25.00
Plates	27.00	29.00
Sheets	34.00	36.00
Hot strip	21.50	23.50
Cold strip	28.00	30.00

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	18.50	19.00	22.50	27.50
Plates	21.50	22.00	25.50	30.50
Sheets	26.50	29.00	32.50	36.50
Hot strip	17.00	17.50	23.00	28.00
Cold stp.	22.00	22.50	28.50	36.50

Steel Plate

Pittsburgh	2.10c
New York, del.	2.29c
Philadelphia, del.	2.15c
Boston, delivered	2.42c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, base	2.10c
Sparrows Point, base	2.10c
Claymont, del.	2.10c
Youngstown	2.10c
Gulf ports	2.45c
Pacific Coast points	2.60c

Steel Floor Plates

Chicago	3.35c
Gulf ports	3.70c
Pacific Coast ports	3.95c
Pittsburgh	3.35c

Standard Shapes

Pittsburgh	2.10c
Philadelphia, del.	2.21½c
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast points	2.70c

Tin and Terne Plate

Tin Plate, Coke (base box)

Pittsburgh, Gary, Chicago	$5.00
Granite City, Ill.	5.10

Mfg. Terne Plate (base box)

Pittsburgh, Gary, Chicago	$4.30
Granite City, Ill.	4.40

Bars

Soft Steel

(Base, 3 to 25 tons)

Pittsburgh	2.25c
Chicago or Gary	2.25c
Duluth	2.35c
Birmingham	2.25c
Cleveland	2.25c
Buffalo	2.25c
Detroit, delivered	2.35c
Philadelphia, del.	2.57c
Boston, delivered	2.62c
New York, del.	2.59c
Gulf ports	2.60c
Pacific Coast points	2.85c

Rail Steel

To Manufacturing Trade

Pittsburgh	2.10c
Chicago or Gary	2.10c
Detroit, delivered	2.20c
Cleveland	2.10c

Buffalo	2.10c
Birmingham	2.10c
Gulf ports	2.45c
Pacific coast points	2.70c

Iron

Terre Haute, Ind.	2.15c
Chicago	2.15c
Philadelphia	2.47c
Pittsburgh, refined	3.50-8.00c

Reinforcing

New billet, straight lengths, quoted by distributors

Pittsburgh	2.05c
Chicago, Gary, Buffalo Cleve., Birm., Young., Sparrows Pt.	2.05c
Detroit, delivered	2.15c
Gulf ports	2.40c
Pacific coast ports, f.o.b. car docks	2.50c
Philadelphia, del.	2.22c

Rail steel, straight lengths, quoted by distributors

Pittsburgh, Gary, Chicago, Buffalo, Cleveland, Birmingham	1.90c
Detroit, delivered	2.00c
Gulf ports	2.25c
Pacific Coast	2.35c

Wire Products

Pitts.-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads

Standard wire nails	$2.45
Cement coated nails	$2.45

(Per pound)

Polished staples	3.15c
Galv. fence staples	3.40c
Barbed wire, galv.	3.20c
Annealed fence wire	2.95c
Galv. fence wire	3.35c
Woven wire fencing (base C. L. column)	67.00
Single loop bale ties, (base C. L. column)	56.00

To Manufacturing Trade

Base, Pitts. - Cleve. - Chicago-Birmingham (except spring wire)

Bright bess., basic wire	2.60c
Galvanized wire	2.65c
Spring wire	3.20c

Worcester, Mass., $2 higher on bright basic and spring wire.

Cut nails, C. L. Pitts. (10% disc. on all extras) $3.60

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.70c	3.40c
Chicago	2.70c	3.40c
Gary, Ind.	2.70c	3.40c
Detroit	2.75c	*3.50c
Cleveland	2.70c	3.40c
Buffalo	2.70c	3.40c

*Delivered.

Alloy Bars (Hot)

(Base, 3 to 25 tons)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem 2.80c

Detroit, delivered 2.90c

Alloy	Diff.	Alloy	Diff.
S.A.E.		S.A.E.	
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.55	3300	3.80
2500	2.25	3400	3.20

4100 0.15 to 0.25 Mo. 150-4600 0.20 to 0.30 Mo. 1.50-2.00 Ni. 1.10

5100 0.80-1.10 Cr.	0.45
5100 Cr. spring flats	0.15
6100 bars	1.20
6100 spring flats	0.85
Cr. N., Van.	1.50
Carbon Van.	0.85
9200 spring flats	0.15
9200 spring rounds, squares	0.40

Electric furnace up 50 cents.

Piling

Pittsburgh	2.40c
Chicago, Buffalo	2.40c
Gulf ports	2.75c

Strip and Hoops

(Base, hot-rolled, 1 to 25 tons; cold-rolled, 3 to 25 tons)

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham	2.15c
Detroit, del.	2.25c
Philadelphia, del.	2.47c
New York, del.	2.51c
Cooperage hoop, Youngs., Pitts., Chicago, Birm.	2.25c
Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown	2.95c
Chicago	3.05c
Detroit, del.	3.05c
Worcester, Mass.	3.15c

Carbon	Cleve. Pitts.
0.26—0.50	2.95c
0.51—0.75	4.30c
0.76—1.00	6.15c
Over 1.00	8.35c

Worcester, Mass $4 higher.

Commodity Cold-Rolled Strip

Pitts.-Cleve.-Youngstown	3.10c
Detroit, del.	3.20c
Worcester, Mass.	3.50c

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

Standard rails, mill	$40.00
Relay rails, Pittsburgh 20—100 lbs.	32.50-35.50
Light rails, billet qual., Pitts., Chicago, B'ham.	$40.00
Do., rerolling quality	39.00

Cents per pound

Angle bars, billet, mills	2.70c
Do., axle steel	2.35c
Spikes, R. R. base	3.00c
Track bolts, base	4.15c
Car axles forged, Pitts., Chicago, Birmingham.	3.15c
Tie plates, base	2.15c

Base, light rails 25 to 60 lbs., 20 lbs., up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

Bolts and Nuts

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade as per Dec. 1, 1932, lists, carloads 5% un; full containers additional 10%.

Carriage and Machine

½ x 6 and smaller	65-5-5 off
Do. larger, to 1-in.	60-10-5 off
Do. 1⅛ and larger	60-5-5 off
Tire bolts	50-5 off

Stove Bolts

In packages with nuts attached 75 off; in packages with nuts separate 75-12½ off; bulk 85 off on 15,000 of 3-inch and shorter, or 5000 over 3-inch.

Step bolts	50-10-5-5 off
Elevator bolts	50-10-5-5 off
Plow bolts	65-5-5 off

Nuts

Semifinished hex.	U.S.S.	S.A.E.
6-inch and less	65-5	70
⅞-1-inch	60-10	65
1⅛ and larger	60-5	60-5

Hexagon Cap Screws

Milled	50-10-5 off
Upset, 1-in., smaller	65-10 off

Square Head Set Screws

Upset, 1-in., smaller	73-10 off
Headless set screws	62-10 off

Rivets, Washers

Structural, Pittsburgh, Cleveland, Chicago	3.40c
⅞-inch and smaller, Pitts., Chi., Cleve.	65-10 off
Wrought washers, Pitts., Chi., Phila., to jobbers	
and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75 off	

Welded Iron, Steel Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1½ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
⅛	63½	54
¼	66½	58
1—3	68½	60½

Iron

¼	30	13
1—1¼	34	19
1½	38	21½
2	37½	21

Lap Weld

Steel

2	61	52½
2½—3	64	55½
3½—6	66	57½
7 and 8	65	55½
9 and 10	64½	55
11 and 12	63½	54

Iron

2	30½	15
2½—3½	31½	17½
4	33½	21
4½—8	32½	20
9—12	28½	15

Line Pipe

Steel

1 to 3, butt weld	67½
2, lap weld	60
2½ to 3, lap weld	63
3½ to 6, lap weld	65
7 and 8, lap weld	64
10-inch lap weld	63½
12-inch, lap weld	62½

Iron

	Blk.	Galv.
¼ butt weld	25	7
1 and 1¼ butt weld	29	13
1½ butt weld	33	15½
2 butt weld	32½	15
1½ lap weld	23½	7
2 lap weld	25½	9
2½ to 3½ lap weld	26½	11½
4 lap weld	28½	15
4½ to 8 lap weld	27½	14
9 to 12 lap weld	23½	9

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

Lap Welded

Sizes	Gage	Steel	Charcoal Iron
1½" O. D.	13	$ 9.72	$23.71
1¾" O. D.	13	11.06	22.93
2" O. D.	13	12.38	19.35
2¼" O. D.	13	13.79	21.68
2¼" O. D.	12	15.16	.....
2½" O. D.	12	16.58	26.57
2¾" O. D.	12	17.54	29.00
3" O. D.	12	18.35	31.36
3½" O. D.	11	23.15	39.81
4" O. D.	10	28.66	49.90
5" O. D.	9	44.25	73.93
6" O. D.	7	68.14	.....

Seamless

Sizes	Gage	Hot Rolled	Cold Drawn
1" O. D.	13	$ 7.82	$ 9.01
1¼" O. D.	13	9.26	10.67
1½" O. D.	13	10.23	11.79
1¾" O. D.	13	11.64	13.42
2" O. D.	13	13.04	15.03
2¼" O. D.	13	14.54	16.76
2¼" O. D.	12	16.01	18.45
2½" O. D.	12	17.54	20.21
2¾" O. D.	12	18.59	21.42
3" O. D.	12	19.50	22.48
3½" O. D.	11	24.62	28.37
4" O. D.	10	30.54	35.20
4½" O. D.	10	37.35	43.04
5" O. D.	9	46.87	54.01
6" O. D.	7	71.96	82.93

Cast Iron Pipe

Class B Pipe—Per Net Ton

6-in., & over, Birm.	$42.00-43.00
4-in., Birmingham	45.00-46.00
4-in., Chicago	53.80-54.80
6-in. & over, Chicago	50.80-51.80
6-in. & over, east fdy.	46.00
Do., 4-in.	49.00

Class A Pipe $3 over Class B

Stnd. fitgs., Birm., base $100.00

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

Pittsburgh, Chicago, Gary, Cleve., Buffalo, Young., Birm., Sparrows Point	$34.00
Duluth (billets)	36.00
Detroit, delivered	36.00

Forging Quality Billets

6 x 6 to 9 x 9-in., base

Pitts., Chicago, Buffalo	40.00
Duluth	42.00

Sheet Bars

Pitts., Cleveland, Young., Sparrows Point, Buffalo, Canton, Chicago	34.00
Detroit, delivered	36.00

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅜-inch incl.	43.00
Do., over ⅜ to 41/64-in. incl.	48.00

Worcester up $2; Galveston up $6; Pacific Coast up $9.

Skelp

Pitts., Chi., Young., Buff., Coatesville, Sparrows Pt.	1.90c

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$3.75
Connellsville, fdry.	4.75- 5.50
Connell. prem. fdry.	5.75- 6.25
New River fdry.	6.50- 6.75
Wise county fdry.	5.50- 5.75
Wise county fur.	4.50- 4.75

By-Product Foundry

Newark, N. J., del.	10.88-11.35
Chi., ov., outside del.	9.75
Chicago, del.	10.50
Milwaukee, ovens	10.50
New England, del.	12.50
St. Louis, del.	11.00-11.50
Birmingham, ovens	7.00
Indianapolis, del.	10.00
Cincinnati, del.	9.75
Cleveland, del.	10.30
Buffalo, del.	10.50
Detroit, del.	10.25
Philadelphia, del.	10.65

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	16.00c
Toluol, two degree	22.00c
Solvent naphtha	26.00c
Industrial xylol	26.00c

Per lb. f.o.b. Frankford and St. Louis

Phenol (200 lb. drums)	16.25c
Do. (450 lbs.)	15.25c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	5.75c
Per ton, bulk, f.o.b. port	
Sulphate of ammonia	$27.75

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 sil. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$22.00	$22.50	$21.50	$23.00
Birdsboro, Pa.	22.00	22.50	21.50	23.00
Birmingham, Ala.‡	17.38	.....	16.38	22.00
Buffalo	21.00	21.50	20.00	22.00
Chicago	21.00	21.00	20.50	21.50
Cleveland	21.00	21.00	20.50	21.50
Detroit	21.00	21.00	20.50	21.50
Duluth	21.50	21.50	.....	22.00
Erie, Pa.	21.00	21.50	20.50	22.00
Everett, Mass.	22.75	23.25	22.25	23.75
Granite City, Ill.	21.00	21.00	20.50	21.50
Hamilton, O.	21.00	21.00	20.50	.....
Neville Island, Pa.	21.00	21.00	20.50	21.50
Provo, Utah	19.00	.....	.....	.....
Sharpsville, Pa.	21.00	21.00	20.50	21.50
Sparrow's Point, Md.	22.00	.....	21.50	.....
Swedeland, Pa.	22.00	22.50	21.50	23.00
Toledo, O.	21.00	21.00	20.50	21.50
Youngstown, O.	21.00	21.00	20.50	21.50

‡Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:				
Akron, O., from Cleveland	22.39	22.39	21.89	22.89
Baltimore from Birmingham	22.78	.....	21.66	.....
Boston from Birmingham	22.87	.....	.....	.....
Boston from Everett, Mass.	23.25	23.75	22.75	24.25
Boston from Buffalo	23.25	23.75	22.75	24.24
Brooklyn, N. Y., from Bethlehem	24.50	25.00	.....	.....
Canton, O., from Cleveland	22.39	22.39	21.89	22.89
Chicago from Birminghom	†21.22	.....	.....	.....
Cincinnati from Hamilton, O.	21.24	22.11	21.61	.....
Cincinnati from Birmingham	21.06	.....	20.06	.....
Cleveland from Birmingham	21.32	.....	20.82	.....
Mansfield, O., from Toledo, O.	22.94	22.94	22.44	22.44
Milwaukee from Chicago	22.10	22.10	21.60	22.60
Muskegon, Mich., from Chicago, Toledo or Detroit	24.19	24.19	23.69	24.69
Newark, N. J., from Birmingham	23.15	.....	.....	.....
Newark, N. J., from Bethlehem	23.53	24.03	.....	.....
Philadelphia from Birmingham	22.46	.....	21.96	.....
Philadelphia from Swedeland, Pa.	22.84	23.34	22.34	.....
Pittsburgh district from Neville Island	Neville base, plus 69c, $4c, and $1.24 freight.			
Saginaw, Mich., from Detroit	23.45	23.45	22.95	22.95
St. Louis, northern	21.50	21.50	21.00	...
St. Louis from Birmingham	†21.12	.....	20.62	.....
St. Paul from Duluth	23.63	23.63	.....	24.13

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Standish, N. Y., $26.50, base; $27.74 delivered Philadelphia.

Gray Forge		Charcoal	
Valley furnace	$20.50	Lake Superior fur.	$25.00
Pitts. dist. fur.	20.50	do., del Chicago	28.34
		Lyles, Tenn.	23.50

†Silvery

Jackson county, O., base: 6-6.50 per cent $25.50; 6.51-7—$26.00; 7-7.50—$26.50; 7.51-8—$27.00; 8-8.50—$27.50; 8.51-9—$28.00; 9-9.50—$28.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$60.80

First Quality

Pa., Ill., Md., Mo., Ky.	47.50
Alabama, Georgia	47.50
New Jersey	52.50

Second Quality

Pa., Ill., Ky., Md., Mo.	42.75
Georgia, Alabama	34.20
New Jersey	49.00

Ohio

First quality	39.90
Intermediate	36.10
Second quality	31.35

Malleable Bung Brick

All bases	$56.05

Silica Brick

Pennsylvania	$47.50
Joliet, E. Chicago	56.05
Birmingham, Ala.	47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$28.00
Wire cut	$26.00

Magnesite

Imported dead - burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	$45.00
Do. domestic	40.00
Do., f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00
Quickest magnesite grains, f.o.b. Chewelah, Wash., net ton, bulk	22.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$47.00
Chem. bonded chrome	47.00
Magnesite brick	67.00
Chem. bonded magnesite	57.00

Fluorspar, 85-5

Washed gravel, duty paid, tide, net ton	$23.50-24.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail $20, barge	$22.00
No. 2 lump	22.00-23.00

Ferroalloy Prices

Ferromanganese, 78-82%, tidewater, duty pd. $92.50
Do., del. Pittsburgh 97.77

Spiegeleisen, 19-21% dom.
Palmerton, Pa., spot 28.00
Do., New Orleans 28.00
Do., 26-28%, Palmerton 33.00

Ferrosilicon, 50% freight allowed, c.l. 69.50
Do., ton lot 80.50
Do., 75 per cent 126.00
Spot, $5 a ton higher.

Silicoman, 2½ carbon 97.75
2% carbon 102.75 1% 112.75
Contract ton price $11 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 1.60-1.65

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electrolytic, per ton, c. l., 23-26% f.o.b. Monsanto, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 10.50c
Do., ton lots 11.25c
Do., less-ton lots 11.50c

67-72% carloads, 2% carbon, per lb. contained chrome 16.50c
Do., ton lots 17.25c
Do., less-ton lots 17.75c

	Carloads	Ton lots	Less ton
2% carb.	16.50c	17.25c	17.50c
1% carb.	17.50c	18.25c	18.50c
0.10% carb.	18.50c	19.25c	19.50c
0.20% carb.	19.50c	20.25c	20.50c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Ferrotitanium, 40-45%, lb., con. ti., f.o.b. Niagara Falls, ton lots $1.23
Do., less-ton lots 1.25
20-25% carbon, 0.10 max., ton lots, lb. 1.35
Do, less-ton lots 1.40
Spot 5c higher

Ferrocolumbium, 50-60%, contract, lb. con. col., f.o.b. Niagara Falls $2.25
Do, less-ton lots 2.30
Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, ti., 6-8% carb., carlots, contr., net ton $142.50
Do, spot 145.00
Do, contract, ton lots 145.00
Do, spot, ton lots 150.00

15-18% ti., 3-5% carbon, carlots, contr., net ton 157.50
Do, spot 160.00
Do, contract, ton lots 160.00
Do, spot, ton lots 165.00

Alsifer, contract carlots, f.o.b. Niagara Falls, lb. 7.50c
Do, ton lots 8.00c
Do, less-ton lots 8.50c
Spot ½c lb. higher

Chromium Briquets, contract, any quantity, freight allowed, lb. 7.25c
Do, spot carlots, bulk 7.50c
Do, ton lots 8.00c
Do., less-ton lots 8.25c

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.05
Do, smaller lots 2.15

Vanadium Pentoxide, contract, lb. contained $1.10
Do, spot 1.15

Chromium Metal, 98% cr., 0.50 carbon max., contract, lb. con. chrome 80.00c
Do, spot 85.00c
88% chrome, contract 79.00c
Do, spot 84.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.00c
Do, 2% 12.50c
Spot ¼c higher

Silicon Briquetes, contract, carloads freight allowed, ton $69.50
Carload, spot 74.50
Less-ton lots, lb. 3.75c

Manganese Briquets, contract carloads, bulk freight allowed, lb. 4.75c
Ton lots 5.25c
Less-ton lots 5.50c
Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, gross ton $97.50
Do, spot 102.50
34-40%, contract, carloads, lb., alloy 14.00c
Do, ton lots 15.00c
Do, less-ton lots 16.00c
Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. $2.60
Do, 100-200 lb. lots 2.75
Do, under 100-lb. lots 3.00

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets Hot Rolled	Sheets Cold Rolled	Sheets Galv. No. 24
Boston	3.98	4.21	5.21	3.85	3.85	5.66	3.86	4.93	4.76
New York (Metropolitan)	3.94	4.11	4.11	3.76	3.75	5.56	3.73	4.90	4.40
Philadelphia	3.60	3.60	4.10	3.40	3.40	5.00	3.40	....	4.50
Baltimore	3.80	3.95	4.35	3.65	3.65	5.00	3.70	5.05	4.30
Norfolk, Va.	4.00	4.15	4.55	3.85	3.85	5.20	3.90	4.80	5.40
Buffalo	3.60	3.97	3.97	3.77	3.55	5.40	3.50	4.55	4.40
Pittsburgh	3.60	3.75	3.75	3.55	3.55	5.15	3.50	4.60	4.50
Cleveland	3.50	3.65	3.65	3.55	3.73	5.33	3.50	4.70	4.62
Detroit	3.68	3.83	3.83	3.75	3.80	5.42	3.58	4.65	4.74
Cincinnati	3.85	3.82	3.82	3.80	3.83	5.43	3.57	....	4.57
Chicago	3.60	3.75	3.75	3.55	3.55	5.15	3.50	4.45	4.50
Minneapolis	3.85	4.00	4.00	3.80	3.80	5.40	3.75	5.10	4.75
Milwaukee	3.73	3.88	3.88	3.68	3.68	5.28	3.63	4.58	4.63
St. Louis	3.87	4.02	4.02	3.82	3.82	5.42	3.77	4.72	4.77
Kansas City	4.15	4.30	4.30	4.10	4.10	5.70	4.10	....	4.75
Memphis	4.01	4.16	4.16	3.96	3.96	5.71	3.91	....	5.26
Chattanooga	3.90	4.05	4.05	3.85	3.85	5.80	3.80	....	4.40
Tulsa, Okla.	4.64	4.79	4.79	4.59	4.59	6.19	4.54	....	5.54
Birmingham, Ala.	3.50	3.65	3.65	3.45	3.45	5.83	3.40	....	4.75
New Orleans	3.85	4.65	4.65	3.80	3.80	5.75	4.10	....	4.60
Houston, Tex.	3.50	5.85	6.25	4.05	4.05	5.65	3.95	....	5.25
Seattle	4.30	4.50	5.85	4.05	4.15	5.90	4.20	....	5.50
Portland, Oreg.	4.30	4.70	6.10	4.15	4.15	5.90	3.75	6.50	4.75
Los Angeles	4.00	4.50	6.35	4.00	4.00	6.20	4.20	6.30	5.05
San Francisco	4.05	4.45	6.00	4.00	4.00	5.60	4.00	6.40	5.15

	Cold Rolled Strip	Cold Finished Bars	SAE Hot-rolled Bars (Unannealed) 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series	SAE Cold Drawn Bars 2300	SAE Cold Drawn Bars 3100
Boston	3.61	4.43	4.28	7.65	6.25	6.00	8.05	8.73	7.33
New York	3.66	4.39	4.14	7.50	6.10	5.85	....	8.69	7.29
Philadelphia	3.66	4.36	3.85	7.46	6.06	5.81	8.71	....	....
Baltimore	....	4.35	3.95	....	....	....	....	....	....
Norfolk, Va.	....	4.60	....	....	....	....	....	....	....
Buffalo	3.57	4.05	3.80	7.25	5.85	5.60	7.65	8.25	6.85
Pittsburgh	3.35	3.95	3.80	7.35	5.95	5.70	7.75	8.35	6.95
Cleveland	3.35	4.05	3.70	7.45	6.05	6.05	7.85	8.25	6.85
Detroit	3.55	4.10	3.83	7.57	6.17	5.92	7.30	8.55	7.15
Cincinnati	3.60	4.30	3.90	7.59	6.19	5.94	8.99	8.60	7.20
Chicago	3.65	4.05	3.80	7.25	5.85	5.60	7.65	8.25	6.85
Minneapolis	....	4.64	4.00	7.60	6.20	8.79	9.34	8.94	7.54
Milwaukee	....	4.18	3.93	7.48	6.08	5.85	7.88	8.48	7.08
St. Louis	3.76	4.32	4.07	7.62	6.22	5.97	8.02	8.62	7.22
Kansas City	4.46	4.60	....	....	....	....	....	....	....
Memphis	....	4.61	....	....	....	....	....	....	....
Chattanooga	....	4.90	....	....	....	....	....	....	....
Tulsa, Okla.	....	5.09	....	....	....	....	....	....	....
Birmingham, Ala.	....	4.73	....	....	....	....	....	....	....
New Orleans	5.00	5.10	....	....	....	....	....	....	....
Seattle	....	5.60	5.65	....	7.80	7.65	8.45	....	....
Portland, Oreg.	....	5.60	6.10	9.00	8.00	7.85	8.70	....	....
Los Angeles	4.45	6.50	4.65	9.40	8.55	8.40	9.05	10.40	9.55
San Francisco	*9.30	6.55	5.20	9.65	8.80	8.65	9.30	10.65	9.80

* Based on minimum quantity.

CURRENT IRON AND STEEL PRICES OF EUROPE

Dollars at Rates of Exchange, Dec. 29

Export Prices f. o. b. Port of Dispatch—

By Cable or Radio

	British gross tons U. K. ports £ s d	Quoted in dollars at current value	Continental Channel or North Sea ports, gross tons **Quoted in gold pounds sterling £ s d
Foundry, 2.50-3.00 Si.	$23.35 5 0 0	$17.04	2 0 0
Basic bessemer	....	15.98	1 17 6
Hematite, Phos. .03-.05	26.83 5 15 0*	.....	.....
Billets	$36.78 7 17 6	$42.60	5 0 0
Wire rods, No. 5 gage	52.65 11 5 6	43.66	5 2 6
Standard rails	$47.28 10 2 6	$48.99	5 15 0
Merchant bars	2.29c 11 0 0	2.00c to 2.05c	5 2 6 to 5 5 0
Structural shapes	2.21c 10 12 6	1.90c	4 17 6
Plates, †¼ in. or 5 mm.	2.41c 11 11 3	2.19c to 2.39c	5 12 6 to 6 2 6
Sheets, black, 24 gage or 0.5 mm.	2.70c 13 0 0	2.93c	7 10 0°
Sheets, gal., 24 ga., corr.	3.28c 15 15 0	3.51c	9 0 0
Bands and strips	2.76c 13 5 0	2.05c	5 5 0
Plain wire, base	4.06c 19 10 0	2.39c to 2.83c	6 2 6 to 7 5 0
Galvanized wire, base	4.84c 23 5 0	3.07c to 3.17c	7 17 6 to 8 2 6
Wire nails, base	3.85c 18 10 0	2.73c to 2.93c	7 0 0 to 7 10 0
Tin plate, box 108 lbs.	$ 4.73 1 0 3	.....	.....

British ferromanganese $92.50 delivered Atlantic seaboard duty-paid.

Domestic Prices at Works or Furnace—

Last Reported

	£ s d		French Francs		Belgian Francs		Reich Mark
Fdy. pig iron, Si. 2.5	$25.45	5 9 0(a)	$15.79	598	$16.85	500	$25.27	63
Basic bess. pig iron	23.35	5 0 0(a)	.....	...	.....	...	27.88	(b)69.50
Furnace coke	6.42	1 7 6	5.94	225	7.25	215	7.62	19
Billets	36.78	7 17 6	22.18	840	28.98	860	38.71	96.50
Standard rails	2.11c	10 2 6	1.38c	1,150	2.06c	1,375	2.38c	132
Merchant bars	2.54c	12 4 0††	1.30c	1,080	1.65c	1,100	1.98c	110
Structural shapes	2.29c	11 0 6††	1.27c	1,055	1.65c	1,100	1.93c	107
Plates, †¼-in. or 5 mm.	2.44c	11 14 3††	1.62c	1,350	2.06c	1,375	2.29c	127
Sheets, black	3.28c	15 15 0§	1.92c	1,600‡	2.36c	1,575‡	2.59c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	3.85c	18 10 0	2.70c	2,250	4.13c	2,750	6.66c	370
Plain wire	4.06c	19 10 0	1.98c	1,650	2.48c	1,650	3.11c	173
Bands and strips	2.69c	12 19 0††	1.45c	1,210	1.95c	1,300	2.29c	127

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel. (a) del. Middlesbrough. 5s rebate to approved customers. (b) hematite. °Close annealed. ††Rebate of 15s on certain conditions.

**Gold pound sterling carries a premium of 75 per cent over paper sterling.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated; † indicates brokers prices

HEAVY MELTING STEEL

Birmingham, No. 1	†12.00
Bos. dock No. 1 exp.	13.50-13.75
New Eng. del. No. 1	14.00
Buffalo, No. 1	13.75-14.25
Buffalo, No. 2	11.75-12.25
Chicago, No. 1	13.50-14.00
Chicago, auto, no alloy	12.00-12.50
Chicago, No. 2 auto	11.00-11.50
Cincinnati, dealers	11.50-12.00
Cleveland, No. 1	13.50-14.00
Cleveland, No. 2	12.50-13.00
Detroit, No. 1	10.00-10.50
Detroit (industrial)	10.50-11.00
Eastern Pa., No. 1	15.00-15.50
Eastern Pa., No. 2	13.00-13.50
Federal, Ill.	12.00-12.50
Granite City, R. R.	12.50-13.00
Granite City, No. 2	12.00-12.50
Los Angeles, No. 1	12.00-12.50
Los Angeles, No. 2	11.00-11.50
N. Y. dock No. 1 exp.	11.50-12.00
Pitts., No. 1 (R.R.)	16.00-16.50
Pittsburgh, No. 1	15.50-16.00
Pittsburgh, No. 2	14.50-15.00
St. Louis, R. R.	13.00-13.50
St. Louis, No. 2	12.00-12.50
San Francisco, No. 1	12.00
Seattle, No. 1	14.00
Toronto, dirs. No. 1	10.00-11.00
Valleys, No. 1	14.50-15.00

COMPRESSED SHEETS

Buffalo	11.75-12.25
Chicago, factory	12.50-13.00
Chicago, dealer	11.50-12.00
Cincinnati, del.	11.00-11.50
Cleveland	13.00-13.50
Detroit	11.50-12.00
E. Pa., new mat.	15.50
E. Pa., old mat.	11.00-11.50
Los Angeles	12.50-13.00
Pittsburgh	15.50-16.00
St. Louis	10.00-10.50
Valleys	14.00-14.50

BUNDLED SHEETS

Buffalo, No. 1	12.00-12.50
Buffalo, No. 2	11.00-11.50
Cleveland	10.00-10.50
Los Angeles	14.00
Pittsburgh	14.50-15.00
St. Louis	7.50- 8.00
Toronto, dealers	4.00

SHEET CLIPPINGS, LOOSE

Chicago	8.50- 9.00
Cincinnati, dealers	7.00- 7.50
Detroit	8.50- 9.00
†Los Angeles	3.75- 4.00
St. Louis	7.00- 7.50

BUSHELING

Buffalo, No. 1	11.75-12.25
Chicago No. 1	12.50-13.00
Cincin., No. 1, deal.	8.00- 8.50
Cincinnati, No. 2	3.50- 4.00
Cleveland, No. 2	7.25- 7.75
Detroit, No. 1, new	9.75-10.25
Valleys, new, No. 1	13.50-14.00
Toronto, dealers	4.00

MACHINE TURNINGS (Long)

Birmingham	†4.50- 5.00
Buffalo	7.00- 7.50
Chicago	7.00- 7.50
Cincinnati, dealers	4.75- 5.25
Cleveland	7.00- 7.50
Detroit	5.50- 6.00
Eastern Pa.	9.00- 9.50
Los Angeles	4.50- 4.75
New York	†3.50- 4.00
Pittsburgh	9.50-10.00
St. Louis	4.00- 4.50
Toronto, dealers	4.25- 4.75
Valleys	8.50- 9.00

SHOVELING TURNINGS

Buffalo	7.50- 8.50
Cleveland	7.50- 8.00
Chicago	8.50- 9.00
Detroit	6.50- 7.00
Pitts., alloy-free	11.25-11.75

BORINGS AND TURNINGS

For Blast Furnace Use

Boston district	2.00
Buffalo	7.25- 7.75
Cincinnati, dealers	3.50- 4.00
Cleveland	7.50- 8.00
Eastern Pa.	6.50- 7.00
Detroit	5.50- 6.00
New York	†2.50- 3.00
Pittsburgh	8.25- 8.75
Toronto, dealers	3.50

AXLE TURNINGS

Boston district	†7.50
Buffalo	9.50-10.00
Chicago, elec. fur.	13.00-13.50
East. Pa., elec. fur.	13.00-13.50
St. Louis	9.00- 9.50
Toronto	5.00

CAST IRON BORINGS

Birmingham	†6.00- 6.50
Boston dist. chem.	†6.00- 6.25
Buffalo	7.75- 8.25
Chicago	5.50- 6.00
Cincinnati, dealers	3.50- 4.00
Cleveland	7.25- 7.75
Detroit	5.50- 6.00
E. Pa., chemical	10.00-11.00
New York	†3.50- 4.00
St. Louis	2.50- 3.00
Toronto, dealers	3.50

RAILROAD SPECIALTIES

Chicago	15.75-16.25

ANGLE BARS—STEEL

Chicago	15.50-16.00
St. Louis	14.00-14.50

SPRINGS

Buffalo	16.00-16.50
Chicago, coil	17.00-17.50
Chicago, leaf	16.00-16.50
Eastern Pa.	17.00-17.50
Pittsburgh	16.75-17.25
St. Louis	15.50-16.00

STEEL RAILS, SHORT

Birmingham	†12.00-12.50
Buffalo	17.00-17.50
Chicago (3 ft.)	15.50-16.00
Chicago (2 ft.)	16.75-17.25
Cincinnati, dealers	16.75-17.25
Detroit	16.50-17.00
Los Angeles	15.00-15.50
Pitts., 3 ft. and less	16.75-17.25
St. Louis, 2 ft. & less	16.25-16.75

STEEL RAILS, SCRAP

Boston district	†13.50-14.00
Buffalo	16.00-16.50
Chicago	14.00-14.50
Cleveland	17.00-17.50
Pittsburgh	16.25-16.75
St. Louis	14.50-15.00
Seattle	16.00

FROGS, SWITCHES

Chicago	13.50-14.00
St. Louis, cut	14.25-14.75

ARCH BARS, TRANSOMS

St. Louis	14.00-14.50

PIPE AND FLUES

Chicago, net	9.50-10.00
Cincinnati, dealers	7.25-7.75

RAILROAD GRATE BARS

Buffalo	10.00-10.50
Chicago, net	9.00- 9.50
Cincinnati, dealers	7.00- 7.50
Eastern Pa.	13.50-14.00
New York	†8.50- 9.00
St. Louis	9.50-10.00

RAILROAD WROUGHT

Birmingham	†11.00-11.50
Boston district	†9.50-10.00
Eastern Pa., No. 1	15.50-16.00
St. Louis, No. 1	10.75-11.25
St. Louis, No. 2	12.50-13.00
Toronto, No. 1 dlr.	10.00

FORGE FLASHINGS

Boston district	†8.00- 8.25
Buffalo	11.75-12.25
Cleveland	11.50-12.00
Detroit	9.50-10.00
Los Angeles	9.00
Pittsburgh	14.50-15.00

FORGE SCRAP

Boston district	†6.50
Chicago, heavy	16.50-17.00

LOW PHOSPHORUS

Buffalo, crops	16.50-17.00
Cleveland, crops	18.00-18.50
Eastern Pa., crops	17.00-17.50
Pitts., billet, bloom, slab crops	18.50-19.00

LOW PHOS. PUNCHINGS

Buffalo	15.50-16.00
Chicago	16.00-16.50
Eastern Pa.	17.00-17.50
Pittsburgh	17.25-17.75
Seattle	15.00

RAILS FOR ROLLING

5 feet and over

Birmingham	†14.00-15.00
Boston	15.00-15.50
Chicago	17.50-18.00
New York	†14.50-15.00
Eastern Pa.	17.00-17.50
St. Louis	18.00-18.50

STEEL CAR AXLES

Birmingham	†15.00-16.00
Buffalo	16.50-17.00
Boston district	†16.00
Chicago, net	19.00-19.50
Eastern Pa.	21.50-22.50
St. Louis	19.00-19.50

LOCOMOTIVE TIRES

Chicago (cut)	16.00-16.50
St. Louis, No. 1	13.50-14.00

SHAFTING

Boston district	†14.75-15.00
New York	†15.50-16.00
Eastern Pa.	20.50-21.00
St. Louis, 1¼-3¾"	17.00-17.50

CAR WHEELS

Birmingham	†13.50-14.00
Boston dist., iron	†11.00
Buffalo, steel	16.50-17.00
Chicago, iron	13.50-14.00
Chicago, rolled steel	15.50-16.00
Cincin., iron, deal.	13.50-14.00
Eastern Pa., iron	16.50-17.00
Eastern Pa., steel	17.00-17.50
Pittsburgh, iron	15.00-15.50
Pittsburgh, steel	16.75-17.25
St. Louis, iron	14.00-14.50
St. Louis, steel	15.50-16.00

NO. 1 CAST SCRAP

Birmingham	†12.50-13.00
Boston, No. 1 mach.	†11.00-11.50
N. Eng. del. No. 2	12.00-12.50
N. Eng. del. textile	12.50-13.00
Buffalo, cupola	14.50-15.00
Buffalo, mach.	15.50-16.00
Chicago, agri. net	10.50-11.00
Chicago, auto net	12.00-12.50
Chicago, railr'd net	11.00-11.50
Chicago, mach. net	12.00-12.50
Cincin., mach. deal.	13.50-14.00
Cleveland, mach. net	16.75-17.25
Eastern Pa., cupola	16.50-17.00
E. Pa., mixed yard	14.50-15.00
Los Angeles, net	13.50-14.00
Pittsburgh, cupola	15.25-15.75
San Francisco, del.	13.50-14.00
Seattle	10.00-12.00
St. Louis, cupola	12.50-13.00
St. Louis, agri. mach.	14.50-15.00
St. L., No. 1 mach.	15.00-15.50
Toronto, No. 1, mach., net	11.00-12.00

HEAVY CAST

Boston dist. break.	†10.75-11.00
New England, del.	12.50-13.00
Buffalo, break.	11.00-11.50
Cleveland, break, net	13.00-13.50
Detroit, auto net	13.00-13.50
Detroit, break	9.50-10.00
Eastern Pa.	15.50-16.00
Los Ang., auto, net	13.00-13.50
New York, break.	†11.50-12.00
Pittsburgh, break	13.25-13.75

STOVE PLATE

Birmingham	†7.50- 8.00
Boston district	†8.00- 8.25
Buffalo	13.00-13.50
Chicago, net	8.50- 9.00
Cincinnati, dealers	7.00- 7.50
Detroit, net	8.50- 9.00
Eastern Pa.	13.50
New York, fdy.	†10.00-10.50
St. Louis	9.00- 9.50
Toronto dealers, net	7.50- 8.00

MALLEABLE

Birmingham, R. R.	†10.50-11.00
New England, del.	14.50-15.00
Buffalo	13.50-14.00
Chicago, R. R.	15.00-15.50
Cincin., agri. deal.	12.00-12.50
Cleveland, rail	15.00-15.50
Eastern Pa., R. R.	16.00-16.50
Los Angeles	17.50-18.00
Pittsburgh, rail	14.25-14.75
St. Louis, R. R.	12.00-13.00

Iron Ore

Lake Superior Ore

Gross ton, 51½%

Lower Lake Ports

Old range bessemer	$5.25
Mesabi nonbes.	4.95
High phosphorus	4.85
Mesabi bessemer	5.10
Old range nonbes.	5.10

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56.63% con.	9.00-9.25
Cop.-free low phos. 58-60%	nominal

Foreign Ore

Cents per unit, c.i.f. Atlantic

Foreign manganiferous ore, 45.55% iron, 6-10% man. nom.	12.00
No. Afr. low phos.	12.50-13.00
Swedish low phos.	12.50-13.00
Spanish No. Africa basic, 50 to 60% nom.	11.00
Tungsten. sh. ton. unit, duty pd. nom.	19.00
N. F., fdy., 55%	7.00
Chrome ore, 48% gross ton, c.i.f.	$23.00-24.00
Molybdenum ores sulphide, per lb. molybdenum contained, f.o.b. mill	0.75

Manganese Ore

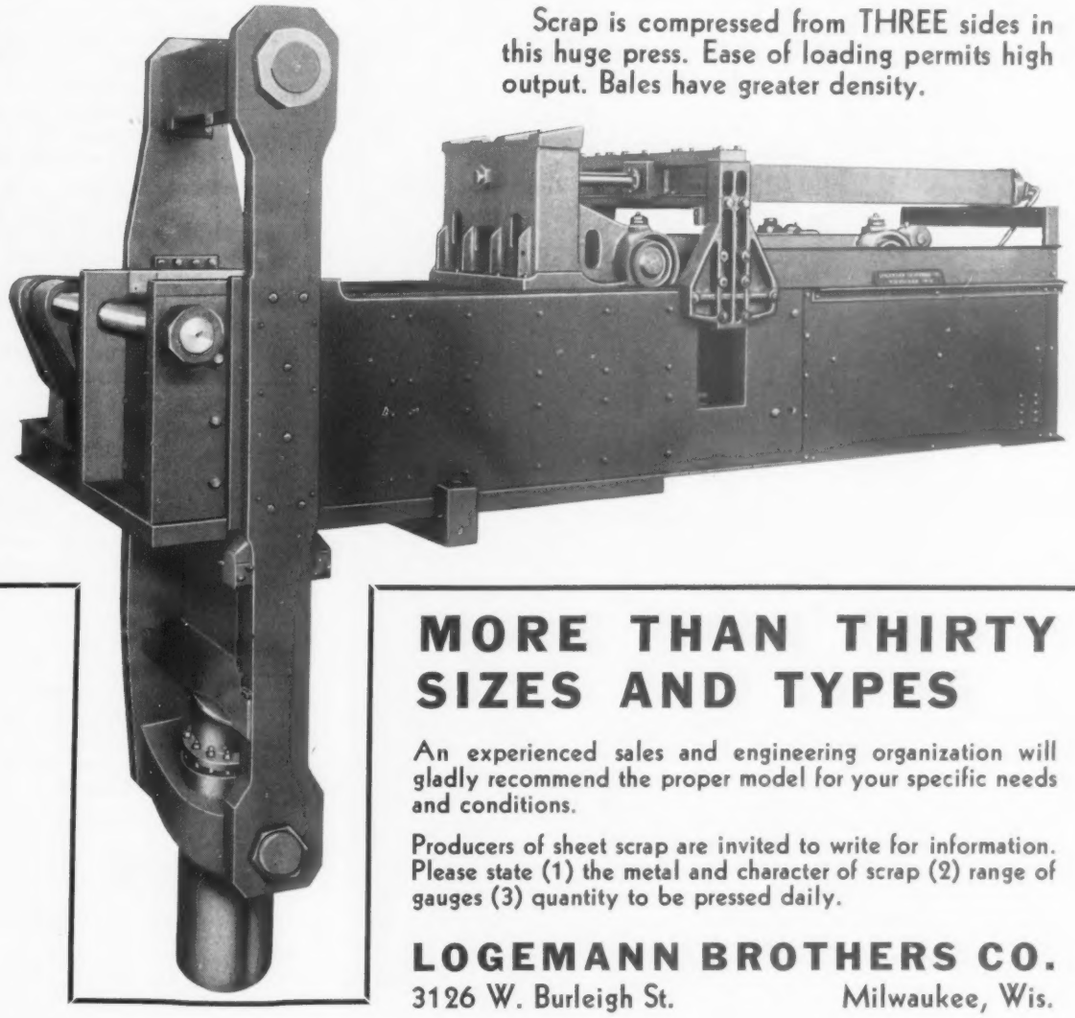
Prices not including duty, cents per unit cargo lots.

Caucasian, 50-52% nom.	30.00-31.00
So. African, 50-52% nom.	30.00-31.00
Indian, 49-50%	29.00-30.00

LOGEMANN

SCRAP PRESSES

POWERFUL RUGGED RELIABLE



Scrap is compressed from THREE sides in this huge press. Ease of loading permits high output. Bales have greater density.

MORE THAN THIRTY SIZES AND TYPES

An experienced sales and engineering organization will gladly recommend the proper model for your specific needs and conditions.

Producers of sheet scrap are invited to write for information. Please state (1) the metal and character of scrap (2) range of gauges (3) quantity to be pressed daily.

LOGEMANN BROTHERS CO.
3126 W. Burleigh St. Milwaukee, Wis.

Baling Presses . . . Pumps . . . Straighteners . . . Accumulators . . . Valves

Sheets, Strip

Sheet, Strip Prices, Pages 266, 267

Cleveland—Specifications for flat-rolled steel from stove, refrigerator, radio and other miscellaneous consumers remain at a low ebb. Some automotive interests have entered the market, but only for relatively small tonnages for fill-in purposes. Additional specifications from this source for considerably larger tonnages are expected during January. Sellers report business booked during December was below November and considerably less than October. Early estimates for January indicate an encouraging gain in specifications, perhaps exceeding that reported during November. Prices remain firm on all finishes, with the exception of galvanized in a few isolated instances.

Chicago — Production of flat-rolled steel has continued heavy despite the year-end letdown in demand for most products. Previous releases against sheets and strip ordered early in fourth quarter have bolstered operations lately. While one producer indicates shipments on these contracts largely have been completed, several mills report deliveries will extend several weeks into 1939. Sales are spotty, although automotive interests again are starting to order more heavily. More general buying is not looked for until late January.

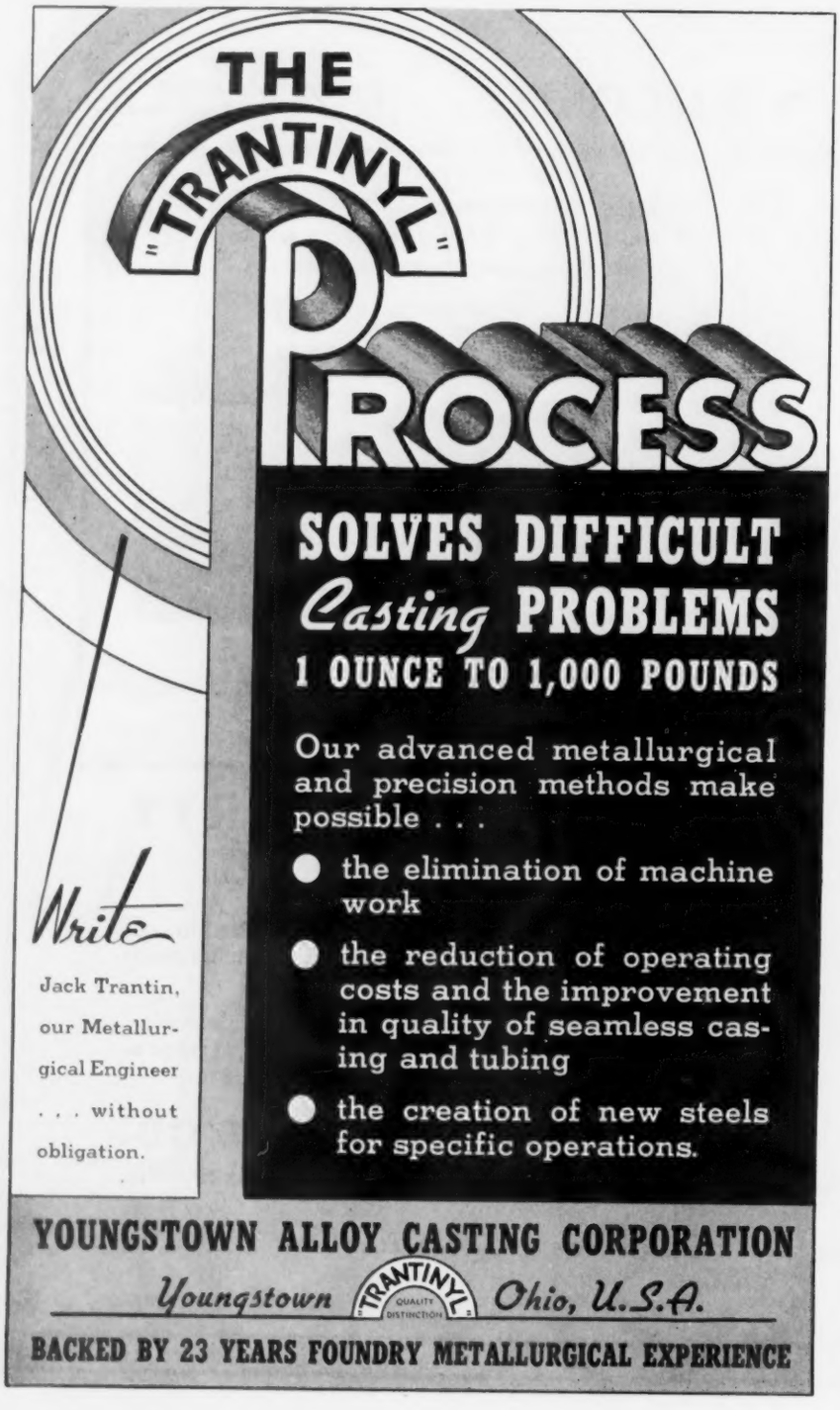
New York — Outlook for sheets this month is encouraging, with improved specifications from stove manufacturers expected to contribute to a better showing. Stove specifications usually reach their peak in late October or early November, but recently there has been a spurt and indications point to larger volume this month. Refrigerator interests also are counted on to release material more freely than usual. Residential construction partly is responsible for activity in stoves and refrigerators.

Philadelphia — Sheet buying has been fairly good, considering the season, and prospects are encouraging. Stove specifications are brisk for this period, and demand from other makers of household equipment and appliances is more promising. Apparently only a relatively small tonnage placed at concessions last October is being carried over into the new year.

Buffalo—While little new buying of sheets or strip is reported, shipments are holding. Rolling schedules during the holiday week were about equal to the previous period as automotive manufacturers and partsmakers continued to ask for prompt shipment on old orders.

St. Louis — Sheet buying is light, but production has continued heavy through the holiday period. Galvanized sheets are in best demand. With the closing of stove plants, shipments of enameling stock have declined. Prices are steady.

Birmingham, Ala.—Production of sheets remains at capacity. Distribution is rather evenly divided between manufacturers' sheets and roofing, with the latter having probably a little edge in demand.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Plates

Plate Prices, Page 266

Cleveland—Demand for standard steel plates remains restricted to small miscellaneous tonnages. Local railroads are out of the market and no improvement from this source is anticipated in the near future. Mill operations remain curtailed, with most miscellaneous requirements handled out of warehouse stocks. Prices are unchanged.

Philadelphia—Plate makers con-

tinue to place their principal hope for improved business on ship requirements, although railroad prospects, while still indefinite, appear more encouraging. About 1200 tons may be required for 9500 feet of 42-inch steel pipe for Harrisburg, Pa., on which bids have just been opened, along with concrete and cast iron alternates. Malone Construction Co., Lancaster, Pa., is general contractor for buying and installing 13,500 feet of 20-inch steel pipe for Bethlehem, Pa. Additional sections are to be brought out later.

Birmingham, Ala.—With specification already in or due on Southern Railway's order for 1300 freight cars, plate production is holding up especially well, although there has been some slight tapering in requirements for miscellaneous fabrication.

San Francisco — Tacoma, Wash., on an inquiry for 900 tons of plates for a welded steel pipe line or reinforced concrete pipe line as an alternate, purchased the latter type from American Concrete & Steel Pipe Co. at $207,045. Awards aggregated 7804 and brought the total to date to 52,961 tons as compared with 61,547 tons for the corresponding period in 1937.

Seattle—About 1200 tons of plates and shapes is involved in the contract for a graving dock gate for Puget Sound navy yard, Winslow Marine Railway, Seattle, low at $389,650. C. J. Nordstrom, Seattle, marine architect, opened bids Dec. 28 for construction of a 140-foot steel motor tanker, 500 horsepower, calling for about 200 tons of plates and shapes. Steel Construction Co., Portland, has the contract for a 200,000-gallon water tank for Pasco, Wash.

Plate Contracts Placed

510 tons, two oil barges, to Nashville Bridge Co., Nashville, Tenn.
205 tons, steel mooring buoys, to Gary Steel Products Co., Gary, Ind.
150 tons, storage tanks, Detroit, to Chicago Bridge & Iron Co., Chicago.
125 tons, 150,000-gal. tank and tower, Denver, Colo., to Chicago Bridge & Iron Co., Chicago.

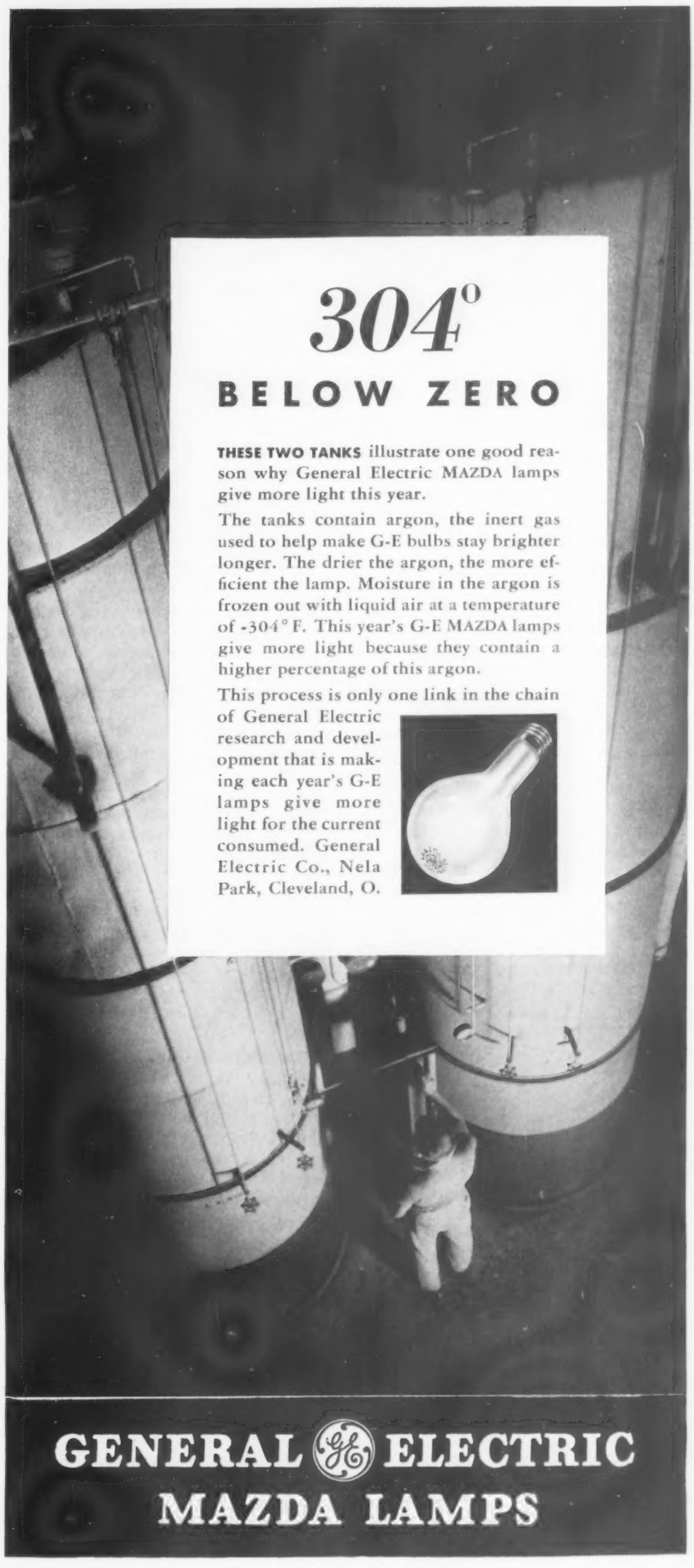
Plate Contracts Pending

Unstated tonnage, caisson Puget Sound navy yard, Wash.; bids in.
Unstated tonnage, 16,580 feet 58-inch pipe, alternate lock joint concrete, for Tacoma, Wash.; bids Dec. 27.
Unstated tonnage, 4500 feet 24 to 42-inch steel water pipe and fittings for Tacoma, Wash.; bids Dec. 29.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 267

Bolt, nut and rivet business in December was better than anticipated, for some producers being better than November. Part of the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BELOW ZERO
THESE TWO TANKS illustrate one good reason why General Electric MAZDA lamps give more light this year.
The tanks contain argon, the inert gas used to help make G-E bulbs stay brighter longer. The drier the argon, the more efficient the lamp. Moisture in the argon is frozen out with liquid air at a temperature of -304° F. This year's G-E MAZDA lamps give more light because they contain a higher percentage of this argon.
This process is only one link in the chain of General Electric research and development that is making each year's G-E lamps give more light for the current consumed. General Electric Co., Nela Park, Cleveland, O.
GENERAL ELECTRIC
MAZDA LAMPS

gain is attributed to stiffening in prices, with accompanying increase in specifications against orders placed previously at concessions. For this reason, possibility is seen of some hesitation in buying during January. Automotive demand continues the chief support but railroad requirements are expected to be more prominent this quarter than during recent months. Bolt and nut quotations indicate a return to published prices and elimination of a number of soft spots prevailing formerly.

Bars

Bar Prices, Page 266

Cleveland—New business in carbon and alloy steel bars is light. Most consumers have been concentrating on reducing inventories the past few weeks, with the result that shipments during December were below November. However, early estimates for January predict a moderate pickup in demand despite anticipated easing in automobile production. Needs of farm equipment manufacturers are expected to be materially increased, reflecting increased activity in preparation for the peak spring demand. Mill operations continue restricted, with deliveries available within a week in most instances. Prices remain firm.

Chicago — Sales volume has suffered from seasonal quiet, particularly as a result of diminishing general demand preceding inventory. Automotive demand has been fairly well maintained, but agricultural equipment makers' requirements are not strong at present. Marked upturn in bookings is expected to take effect early in January, with automotive interests again exerting the strongest influence.

New York — Commercial bar sellers anticipate better business during first quarter than in the past three months. Machine tool building is expected to increase more sharply, with heavier railroad requirements also looked for. In addition, government shop specifications, an important factor in bolstering the market in recent weeks, is counted on to expand further.

Buffalo — Steel bar demand has been fairly well sustained, but the holidays cut into mills' rolling schedules. All producers report a tapering in activity, although buying by automotive users is holding fairly high. Mills anticipate improved operations with the opening of January.

Birmingham, Ala.—Due largely to purchasing by machinery agricultural manufacturers bar output is on the relatively satisfactory basis of approximately 60 per cent and is well maintained as to consistency of purchase.

Pipe

Pipe Prices, Page 267

Pittsburgh — December pipe business was better than anticipated, volume in some products being ahead of November. The year-end letdown was relatively light, only standard pipe being affected noticeably. This latter situation was the result of inventory curtailment by jobbers, but movement from distributors' stocks has been sustained and replenishment is looked for this month. Automotive demand has supported activity in mechanical tubing, although business in oil country goods and boiler tubes has been well maintained.

Cleveland—Shipments of standard steel pipe out of jobbers' stocks during December were somewhat below the November volume. Inventories of most distributors are well balanced at moderately low levels. Demand for cast pipe remains considerably more active than for steel, reflecting an encouraging volume of projects from small municipalities. Increased demand for both steel and cast pipe is predicted for January. Prices are firm.

Chicago — Inquiries for cast iron pipe continue to show an increase. PWA projects far overshadow private construction and are expected to represent most activity during first quarter. All these projects are reported now under construction.

Birmingham, Ala. — While some hesitancy is noted in lettings of cast iron pipe over the holiday period, actual booked business and that in immediate prospect is considerably greater. Tonnage is small individually, but quite satisfactory, comparatively, in the aggregate.

San Francisco — Awards of cast iron pipe totaled 1009 tons, bringing the aggregate for the year so far to 31,829 tons, compared with 29,560 tons a year ago.

Cast Pipe Placed

839 tons, 4 to 10-in., Hillsborough, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

Cast Pipe Pending

2300 tons, 16 and 20-inch, Corvallis, Oreg.; may go steel; Empire Construction Co., Portland, low.

1500 tons, 4 to 20-inch and fittings, Tacoma, Wash.; Paine & Gallucci, Tacoma, low.

500 tons, Hazelwood, Oreg., water district; may go transite. Parker & Schram, Portland, low.

116 tons, 6 and 8-inch, Yakima, Wash.; bids to Seattle WPA office, Dec. 29.

Unstated, $60,000 system project, Weiser, Ida.; bids to D. A. Kramer, city clerk, Dec. 30.

Unstated, water system and materials for Clatskanie, Oreg.; S. S. Montague, Portland, low.

Unstated, water system and materials for Lexington, Oreg.; Jacobsen-Jensen Co., Portland, low.

Unstated tonnage, water system at Haines, Alaska,; $25,000 available; R. J. Sommers, Juneau, Alaska, general contractor.

Wire

Wire Prices, Page 267

Pittsburgh — Wire markets appear more active, with a fair volume of forward business booked. The outlook points to a substantial pickup in demand during January. Farm equipment makers are inquiring for first quarter wire needs, and other consumers show promise of heavier requirements early this quarter. Prices of merchant wire products have strengthened lately, and there is a good possibility that a steady market will rule the near future.

Cleveland—Sellers anticipate a steady increase in demand for merchant wire items this month. This improvement should not necessarily be restricted to merchant items, but it is here the best rate of gain is anticipated. Automobile producers and suppliers continue the largest single consumer of wire and wire rods, although a moderate easing in demand is expected from these channels. Prices remain firm on wire and wire rods.

Chicago—Dull business the past week is expected to be relieved promptly because of the unusually low level of consumers' inventories. Producers look for a marked upturn in demand before the middle of January. Improved stability in prices is counted on to promote buying for a longer distance ahead than was true recently. Some business already has been placed for January shipment.

Birmingham, Ala.—Production of wire is maintained on an even basis at approximately 60 per cent.

Rails, Cars

Track Material Prices, Page 267

Pittsburgh & West Virginia, which recently announced an extensive scrapping campaign has asked permission to sell $1,500,000 in equipment certificates for financing pur-

chase of 600 steel hoppers and 100 steel box cars. RFC assistance is being sought.

Court approval has been given to the St. Louis-Southwestern budget for 1939, including rails and cars.

Pennsylvania railroad is preparing for a large equipment repair program, probably to be started in January. Considerable steel buying is expected to result, including wheels and axles. The same road is expected to buy at least 15 diners shortly.

Locomotives Placed

Minnesota Transfer, three diesel-electric switchers, to Electro-Motive Corp., La-Grange, Ill.

Texas & Pacific, one 600-horsepower diesel-electric switcher, to Electro-Motive Corp., La Grange, Ill.

Car Orders Pending

Pittsburgh & West Virginia, 600 fifty-five-ton steel hoppers and 100 steel boxcars; permission asked to buy.

Shapes

Structural Shape Prices, Page 266

New York — Structural awards continued active last week, aided by closing on a number of public works jobs. Largest eastern booking was 5000 tons for a bridge, Stratford-Milford, Conn.

New orders booked by the structural steel fabricating industry during November were the largest for any months since July, 1937, according to reports received by the American Institute of Steel Construction. During November the industry booked 150,988 tons compared with 138,829 tons during October. In the eleven months ended Nov. 30 1,075,171 tons were placed, against 1,529,561 tons in the same period 1937. Shipments during November continued about the average for the year and consequently backlogs began to show an increase. For the first eleven months last year shipments also were below the volume for the same 1937 period.

Pittsburgh — Structurals have been quieted somewhat by the season, although government projects still give some life. Awards exceed new inquiries for the first time in several weeks, principally because announcement of new PWA work is nearing completion. A few private jobs are included among inquiries. The largest of awards is 4180 tons for a government gun assembly shop, Washington.

Cleveland—Fabricators are kept moderately busy by an encouraging volume of small projects. Outstanding among recent awards include

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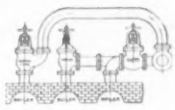
for more than thirty-five years!

GOLDEN-ANDERSON AUTOMATIC CUSHIONED, TRIPLE ACTING, ALSO NON-RETURN VALVES

1. Automatically cut out the boiler the instant that a tube rupture or other internal break occurs.
2. Automatically cut off the steam flow from every boiler the instant that a steam pipe breaks.
3. Automatically equalize the pressure between all boilers.
4. Automatically cut in a boiler making accidents due to inaccurate steam gauge impossible.



5. Positively prevent backflow of steam into a cold boiler.
6. Can be closed by hand, like ordinary stop valve, and arranged with "combination feature" to open valve like regular gate and globe valve.
7. Can be tested in service from boiler room floor.
8. Double Corliss Dash Pot that cushions in opening and closing. As they are sealed and out of current steam flow, dirt and grit cannot bind or stick valves.
9. Cannot pound, spin, stick or chatter.
10. By disconnecting pilot valve, the triple-acting style can be changed into plain non-return.

GOLDEN-ANDERSON CUSHIONED PATENTED AUTOMATIC ALTITUDE VALVES

For automatically maintaining Uniform Stage of Water in Tank, Reservoir or Standpipes. Doing away with the annoyance of freezing and float fixtures inside or outside of tanks. "Three Ways of Closing These Valves."

1. Automatically, by water.
2. By electricity, if desired.
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May also be arranged to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe. No valves or fixtures inside or outside.

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3. Thoroughly cushioned. No chattering, hammering or sticking.
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Fulton Building **Pittsburgh, Pa.**

255 tons for a plant addition to the Standard Brewing Co., Cleveland, and 375 tons for the Islay Dairy building, Youngstown, O. Lundoff-Bicknell Co., Cleveland, is low on 125 tons for the Cleveland veterans' hospital project. The outlook offers considerable encouragement to fabricators, with an increasing number of private and public projects scheduled to reach the bidding stage. Fabricated prices continue weak.

Chicago — Fabricated shape awards continue fairly heavy, but new inquiries are lighter. Subway work includes the placing of 700 tons for two stations and the calling for bids Jan. 5 on the second section, involving 225 tons of shapes, in addition to 2500 tons of bars. Two Texas bridge inquiries require 1000 tons.

Philadelphia—While little tonnage has been placed recently, substantial work continues under contemplation, including some private work. Fabricators generally look for a much improved year in 1939. Meanwhile they are continuing their efforts to strengthen fabricated material prices.

Buffalo—Expectations of bidding dates being announced on an avalanche of jobs early in 1939 are buoying hopes of steel fabricators. Schools make up a major part of the projects pending, many of which call for less than 100 tons. The Benz Engineering Co., Salamanca, N. Y., was low on the general contract for the school at Brocton, N. Y., and Fleischer Engineering Co., Buffalo, was low on the general contract for the Willert Park housing project, Buffalo.

St. Louis — Interest in structurals centers chiefly in public works, more particularly bridges. Spans over the Mississippi river, Greenville, Miss., and Natchez, Miss., general contracts for foundations for which have been let, call for 10,000 tons and 8000 tons of structural shapes, respectively.

San Francisco — Among the larger awards were 922 tons for a bridge, Yellowstone National Park, Wyoming, and 500 tons for a locomotive crane for the Mare Island, Calif., navy yard. American Bridge Co. is low on 6000 tons for a machine shop at the navy yard, Mare Island and Bethlehem Steel Co. is low on 3000 tons for an assembly shop at the naval air base, Alameda, Calif. Awards totaled 2784 tons.

Seattle — Sufficient tonnage is in prospect to give fabricators a good start in 1939. Bids were recently opened for 5207 tons involved in four units of the Lake Washington pontoon bridge. Port of Seattle has called bids Jan. 9 for superstructure at Pier 40 involving 460 tons. Denver has invited bids Jan. 4, Spec. 1163-D for furnishing 18 cast steel draft tube pier noses for Coulee, tonnage unstated.

Shape Contracts Placed

5000 tons, bridge, Housatonic river, Stratford-Milford, Conn., to American Bridge Co., Pittsburgh.

5000 tons, bridge over Ohio river for the Owensboro bridge commission, to Hunter Steel Co., Neville Island, Pittsburgh.

4180 tons, gun assembly shop, building 197, for U. S. government, Washington, to American Bridge Co., Pittsburgh.

1900 tons, dredge line, Keystone dam, Hawthorne, Nebr., to Bethlehem Steel Co., Bethlehem, Pa.

1550 tons, Nassau county courthouse, Garden City, Long Island, to American Bridge Co., Pittsburgh.

1300 tons, bridge, W. Kansas avenue, Kansas City, Kans., for Wyandotte county, to Kansas City Structural Steel Co., Kansas City.

930 tons, bridge No. 325G, Monroe county, Wisconsin, Milwaukee Bridge Co., Milwaukee.

922 tons, bridge in Yellowstone National Park, Wyo., to unnamed interest.

860 tons, lead head crusher building, South Dakota, to Worden-Allen Co., Milwaukee.

700 tons, bridge, Brazoria, Tex., to Bethlehem Steel Co., Bethlehem, Pa.

690 tons, bridge, Brazos, Tex., to Bethlehem Steel Co., Bethlehem, Pa.

660 tons, Outer Drive grade separation, Detroit, to American Bridge Co., Pittsburgh.

660 tons, apartment house, Thirty-fifth street and Park avenue, New York, to Harris Structural Steel Co., New York.

475 tons, courthouse addition, Trenton, N. J., to Lehigh Structural Steel Co., Allentown, Pa.

460 tons, bottling works extension, Pfeiffer Brewing Co., Detroit, to R. C. Mahon Co., Detroit.

440 tons, overhead crossing, Bakersfield, Calif., to Consolidated Steel Corp., Los Angeles.

440 tons, two apartment houses, Mt. Vernon, N. Y., to Goodstein Iron & Steel Co., New York.

400 tons, high school building, East Chicago, Ind., to United Boiler Heating & Foundry Co., Hammond, Ind.

400 tons, extension to dairy plant, Youngstown, O., for Isaly Dairy Co., to Ohio Structural Steel Co., Newton Falls, O.

393 tons, Umpqua river bridge, Douglas county, Oregon, to unnamed interest.

360 tons, factory building, Hinde & Dauch Co., Detroit, to Taylor & Gaskin, Detroit.

360 tons, bridge, FAP-684-C, Lee & Burlesson counties, Texas, to Mosher Steel Co., Houston, Tex.

300 tons, dining hall, College stations, Tex., to Austin Bros., Dallas, Tex.

280 tons, building, A. F. Gallun & Sons, Milwaukee, to Lakeside Bridge & Steel Co., Milwaukee.

250 tons, highway bridge FAGH-177-D, Bryan county, Georgia, to Virginia Bridge Co., Roanoke, Va.

235 tons, Belknap street school, Lockport, N. Y., to Ernst Iron Works Inc., Buffalo.

240 tons, curbing, Major Deegan boulevard, Bronx, N. Y., to American Bridge

220 tons, Duluth ore spouts, Minnesota, to American Bridge Co., Pittsburgh. Co., Pittsburgh.

210 tons, health center, Corona, Queens county, Long Island, to American Bridge Co., Pittsburgh.

200 tons, Hawley street school, Lockport, N. Y., to Ernst Iron Works, Buffalo.

190 tons, men's dormitory, Lafayette, Ind., to Indiana Bridge Co., Muncie, Ind.

190 tons, children's school, U. S. government, Ft. Knox, Ky., to Snead Architectural Iron Works, Louisville, Ky.

189 tons, tunnel supports, specification 806, Kenneth division, Central Valley project, Delta, Calif., to unnamed interest.

175 tons, state bridge, Marion, Mich., to Bethlehem Steel Co., Bethlehem, Pa.

150 tons, school No. 5, board of education, Elmira, N. Y., to American Bridge Co., Pittsburgh.

150 tons, Keystone spillway, Nebraska, to Omaha Steel Works, Omaha, Nebr.

145 tons, women's dormitory, B, Bloomington, O., to Central States Bridge & Structural Co., Indianapolis.

143 tons, schedule 4893, U. S. S. Tuna, Mare Island, Calif., navy yard, to unnamed interest.

140 tons, bridge, Johnson county, Illinois, to Midland Structural Steel Co., Cicero, Ill.

134 tons, crossing near Pompey's Pillar, Yellowstone county, Montana, to unnamed interest.

125 tons, bulkhead beams, Mahoning dam, Pennsylvania, for United States government, to Dravo Corp., Pittsburgh.

125 tons, Woolworth store addition, Eastern, Pa., to Bethlehem Contracting Co., Bethlehem, Pa.

120 tons, Red Rock bridge, Columbia county, Bloomsburg, Pa., to American Bridge Co., Pittsburgh.

110 tons, fourth district school, Covington, Ky., to American Bridge Co., Pittsburgh.

110 tons, bridge, Hardin county, Illinois, to Midland Structural Steel Co., Cicero, Ill.

105 tons, staff house, Lincoln hospital, Bronx, New York City, to Drier Structural Steel Co., New York.

105 tons, Roosevelt county bridge, No. 253D, Montana, to American Bridge Co., Pittsburgh.

100 tons, two bridges, Falmouth, Mass., to American Bridge Co., Pittsburgh.

100 tons, building, Mobile, Ala., to Virginia Bridge Co., Roanoke, Va.

100 tons, women's dormitory A, Bloomington, O., to Central States Bridge & Structural Co., Indianapolis.

100 tons, crossing, Roosevelt county, Montana, to unnamed interest.

100 tons, Rillito creek bridge, Pima county, Arizona, to unnamed interest.

Unstated tonnage, gas powered crane for Puget Sound navy yard, Wash., to Ohio Crane Co., Bucyrus, O.

Shape Awards Compared

	Tons
Week ended Dec. 31	**32,921**
Week ended Dec. 24	**35,067**
Week ended Dec. 17	**35,970**
This week, 1937	**8,835**
Weekly average, year, 1937	**23,421**
Weekly average, year, 1938	**21,566**
Weekly average, November	**23,137**
Total to date, 1937	**1,217,907**
Total to date, 1938	**1,121,442**

Includes awards of 100 tons or more.

Shape Contracts Pending

6000 tons, machine shop, schedule 9044, Mare Island navy yard, Calif.; American Bridge Co., Pittsburgh, low on $508,356.

3840 tons, Units 3, 5 and 9, Lake Washington pontoon span and approaches,

Seattle; Puget Construction Co., Seattle, low.
3000 tons, assembly shop, naval air base, Alameda, Calif., specification 9032; Bethlehem Steel Co., Alameda, low at $212,300.
1367 tons, unit 4, Lake Washington pontoon bridge; J. H. Pomeroy, Parker & Schram, Portland, and Puget Sound Bridge & Dredging Co., Seattle, low combined bid.
1200 tons, foundations of bridge over Mississippi, at Greenginne, Miss., Massman Construction Co., Kansas City, Mo., general contractor.
904 tons, bridge, George West, Tex.
700 tons, case structures, Sun Oil Co., Marcus Hook, Pa., and Toledo, O.
675 tons, warehouse building, Anchor Hocking Glass Corp., Salem, N. J.
530 tons, buildings, Fort Jay, N. Y., for United States government.
525 tons, state bridge over Mosey's river, Plainfield, Conn.
460 tons, superstructure pier 40, Port of Seattle; bids Jan. 9.
435 tons, senior high school, board of education, Billings, Mont.
350 tons, Willert Park housing project, Buffalo; Fleischer Engineering Co., Buffalo, low.
260 tons, municipal hospital building, Binghamton, N. Y.
250 tons, girder and beam spans, Gilbertsville dam, Kentucky, Tennessee valley authority, Knoxville, Tenn.
250 tons, nurses' home, Elizabeth Steel Magee hospital, Pittsburgh.
246 tons, bridge, Carthage, Tex.
230 tons, school, board of education, Genesee, N. Y.
200 tons, state highway bridge, Parker, Colo.
185 tons, school, Brocton, N. Y.; Benz Engineering Co., Salamanca, N. Y., low.
180 tons, factory building, American Brake Shoe & Foundry Co., Mahwah, N. J.
175 tons, infirmary building, Potter township, for Beaver county, Pennsylvania.
120 tons, beam bridge, Ottawa, O., for Ohio state.
120 tons, power house addition, Wyandotte, Mich., for city.
Unstated tonnage, trashracks, towers, etc., Rock Island, Wash., fishtraps; Lincoln Steel Works, Lincoln, Nebr., low.
Unstated tonnage, state bridge, Rock Creek, Idaho; Dan Cavanaugh, Twin Falls, general contractor.

Reinforcing

Reinforcing Bar Prices, Page 267

Pittsburgh — With the concrete bar markets at the best level in recent months, prices have stiffened considerably with only one or two sections exhibiting weakness. Recent awards are largely for first quarter delivery, and tonnage now on the books will run mills well into the first quarter. Public works still account for a large majority of the tonnage although inquiries on private construction work, scheduled for placement after the turn of the year, are becoming more frequent.

Cleveland—Little improvement in demand for reinforcing bars has developed recently. However, fabricators are predicting a moderate increase in requirements of both private and public sources during

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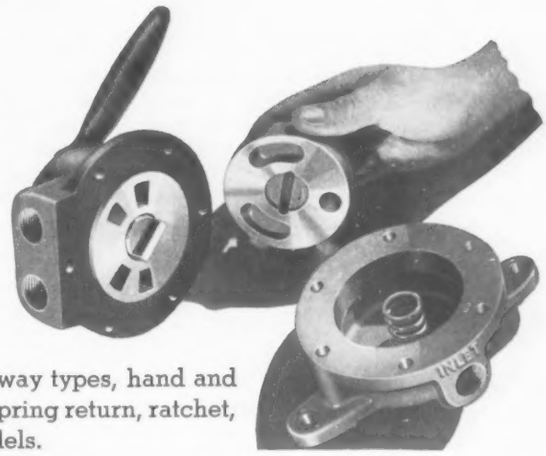

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Made in 3-way and 4-way types, hand and foot operated, manifold, spring return, ratchet, electric and special models.

Write for Valve Bulletin 34-S.

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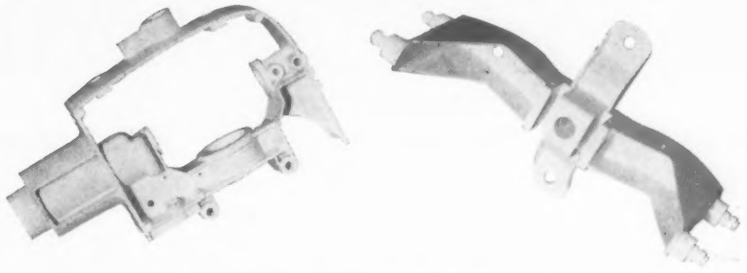

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FAYETTEVILLE, N. Y.—213 Walnut St. 12600 Berea Rd.—CLEVELAND, O.

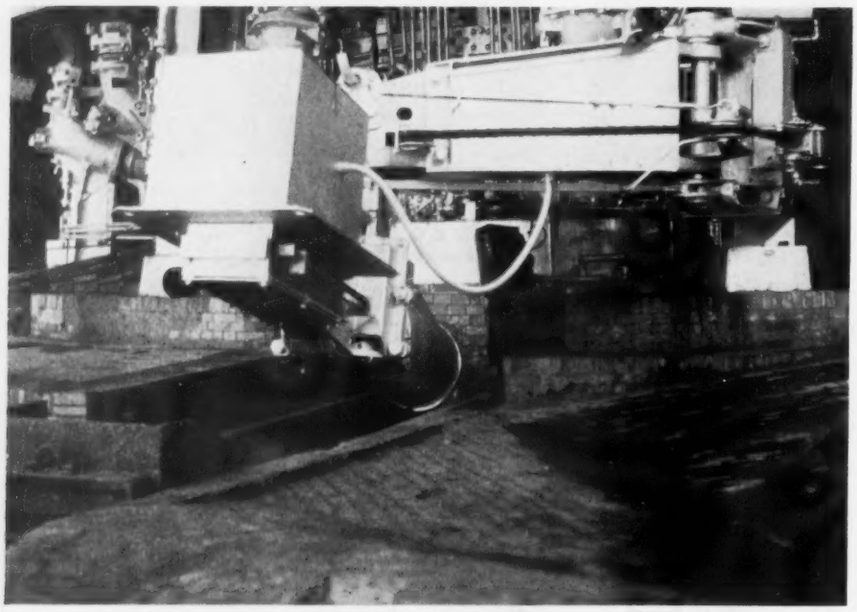
January. Award of 415 tons of rail steel bars for the filtration plant, Sandusky, O., is not expected until the middle of January. Bids are in on 200 tons for the final addition to the Main street bridge, Cleveland. Fabricated prices continue weak.

Chicago—Concrete bar business has been affected but little by holiday influences. A substantial tonnage is involved in numerous small awards averaging 30 to 40 tons each. About 2500 tons for subway construction here is pending for the second section, bids closing Jan. 5. Heavy shipments against previous orders for PWA-financed work will continue during coming weeks.

Philadelphia — Little outstanding tonnage is reported and sellers look for restricted business over the remainder of the winter season. However, a good backlog of tonnage for release later is reported by some sellers.

San Francisco — Awards of reinforcing bars aggregated 3713 tons. Columbia Steel Co. booked 1354 tons for the bureau of reclamation for delivery at Redding, Calif., and 500 tons for delivery at Neroly, Calif. Judson Steel Corp. is low on 1400 tons for Pasadena, Calif., and bids have been opened on 1120 tons for the metropolitan water district, Los Angeles. A heavy tonnage of business pends, exceeding 24,000 tons.

Seattle — Outstanding contract pending involves over 13,000 tons for the Lake Washington pontoon bridge, award expected shortly. Bids for units requiring 4000 tons were opened in November and are pending. New bids for four units calling for 9000 tons were opened Dec. 20 and are declared satisfactory by engineer of Washington Toll Bridge authority. Other awards in abeyance include 3200 tons for the Bonneville powerhouse and 420 tons for a viaduct in Seattle.



SEVENTY-FOUR
BROSIUS TWO MOTOR ELECTRIC MECHANICAL CLAY GUNS

have been sold during the past four years, twenty-eight of them since January 1, 1938. Thirty-five were for installation on American furnaces and thirty-nine for foreign furnaces.

The pull-in rope of the Brosius Electric Gun acts as a clamping mechanism, eliminating the delay of clamping the gun before discharging the clay. The clay is discharged the instant the nozzle enters the tapping hole.

No men are required in the danger zone during plugging and a nine cubic foot clay barrel provides ample clay to take care of any emergency. The hole is stopped safely and continuously under full wind pressure and, if desired, with the iron flowing full. Stopping under full wind pressure produces a more regular operation, a constant gas pressure, and increased production, savings which will pay for the installation in about six months.

More than 300 Blast Furnaces throughout the world have been equipped with Brosius Clay Guns.

OTHER PRODUCTS

Steam and Hydro-Electric Clay Guns, Hand and Motor Operated Goggle Valves, Flue Dust Conditioners, Blast Furnace Slag Granulating Machines, Single Hook Grab Buckets, Automatic Single Hoist Grab Buckets, Overhead and Auto Floor Charging Machines for serving Heating and Melting Furnaces, Auto Floor Manipulators for serving Steam Hammers, Presses, Etc., Soaking Pit Cover Carriages.

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Designers and Manufacturers

PITTSBURGH SHARPSBURG BRANCH PA.

European Distributor: Dango & Dienenthal, Siegen, Westphalia, Germany

Brosius Equipment is covered by patents allowed and pending in the United States and Foreign Countries.

Reinforcing Steel Awards

1354 tons, bureau of reclamation, invitation 33,016-A, for delivery at Redding, Calif., to Columbia Steel Co., San Francisco.

500 tons, bureau of reclamation, invitation B-47,370-A, Neroly, Calif., to Columbia Steel Co., San Francisco.

500 tons, Keppel high school, Alhambra, Calif., to unnamed interest.

500 tons, junior high school, Grosse Point, Mich., to Truscon Steel Co., Youngstown, O.; F. H. Martin Construction Co., contractor.

280 tons, social science building, University of Washington, Seattle, to Northwest Steel Rolling Mill, Seattle; Gjarde Construction Co., Seattle, general contractor.

253 tons, sections 11 and 12, Pennsylvania turnpike, to Bethlehem Steel Co., Bethlehem, Pa.; Girard Construction Co., Philadelphia, contractor.

250 tons, Courier hall, University of Iowa, to Laclede Steel Co., St. Louis; through C. C. Larson, Council Bluffs, Ia., general contractor.

208 tons, Santa Ana river bridge, Riverside county, California, for state, to unnamed interest.

200 tons, first unit of Life Science building, University of California, Los Angeles, to unnamed interest.

170 tons, Horan-O'Donnel chemistry and physics building, Canisius college, Buffalo, to Buffalo Steel Co., Buffalo.

163 tons, baker and cook school, Presidio, San Francisco, to W. S. Wetenhall & Co., San Francisco.

160 tons, addition to high school, Redon-

Concrete Bars Compared

	Tons
Week ended Dec. 31	5,153
Week ended Dec. 24	11,814
Week ended Dec. 17	11,539
This week, 1937	3,419
Weekly average, year, 1937	6,127
Weekly average, year, 1938	6,959
Weekly average, November	7,556
Total to date, 1937	318,583
Total to date, 1938	361,905

Includes awards of 100 tons or more.

do Beach, Calif., to unnamed interest.
150 tons, senior high school, Kenmore, N. Y., to Bethlehem Steel Co., Bethlehem, Pa.; C. F. Haglin & Sons, Buffalo, contractor.
140 tons, school, Brocton, N. Y., to Truscon Steel Co., Buffalo.
125 tons, laundry building, naval academy, Annapolis, Md., to Bethlehem Steel Co., Bethlehem, Pa.; Lange Bros., Baltimore, contractors.
100 tons, Leechburg road, Plum township, Pittsburgh, to Bethlehem Steel Co., Bethlehem, Pa.; L. A. Davidson, Lansing, Mich., contractor.
100 tons, Thaddeus Stevens school, Pittsburgh, to Truscon Steel Co., Youngstown, O.; Siesel Construction Co., contractor.

Reinforcing Steel Pending

8040 tons, Lake Washington toll pontoon bridge; J. H. Pomeroy, Parker & Schram, Portland, and Puget Sound Bridge & Dredging Co., Seattle, combined low bidders at $3,253,597. (Unit 4.)
1400 tons, Pasadena, Calif.; Judson Steel Corp., Oakland, Calif., low.
2500 tons, army hospital, Fitzsimmons, Colo.
1000 tons, men's dormitory, Ann Arbor, Mich.
950 tons, foundation for bridge over Mississippi river, Natchez, Miss.; Dravo Corp., Pittsburgh, general contractor.
920 tons, part of foundation for bridge over Mississippi river, Greenville, Mo.; Massman Construction Co., Kansas City, Mo., general contractor.
543 tons, Unit 5, Lake Washington pontoon bridge; Puget Construction Co., Seattle, low.
500 tons, three double commissioned officers' quarters and one single field office, Holabird, Q. M. D., Baltimore; Consolidated Engineering Co., Baltimore, low bidders.
300 tons, Four Mile run drainage basin, Pittsburgh.
280 tons, dormitories, Ohio State university, Columbus, O.
250 tons, school, Dillon, Mont.
250 tons, section C, Purdue university, Lafayette, Ind.
250 tons, Union garage, Minneapolis.
250 tons, basin sewer, Columbus avenue, Pittsburgh.
250 tons, school, Brighton, N. Y.; M. Iuppa, Rochester, N. Y., low.
230 tons, bridge over Mississippi river, Miami, Mo.; Massman Construction Co., Kansas City, Mo., general contractor.
200 tons, hospital, Alpena, Mich.
185 tons, Willert Park housing project, Buffalo; Fleischer Engineering Co., Buffalo, low.
180 tons, Indiana boys' school, Plainfield, Ind.
175 tons, bridge, Elkhart, Ind.
Unstated tonnage, 58-inch concrete pipe contract, Tacoma, Wash., to American Concrete & Steel Pipe Co., Tacoma, general contractor.
Unstated tonnage, state capitol unit, Olympia, Wash., MacDonald Building Co., Tacoma, low.
Unstated tonnage, 400-foot railroad viaduct; bids at Spokane, Wash., Jan. 13.
Unstated tonnage, state bridge Whitefish river, Montana; J. L. McLaughlin, Great Falls, low.
Unstated tonnage, fish screens, Wapato project, Washington state; Yakima Concrete Products Co., Yakima, Wash., low.

Ferroalloys

Ferroalloy Prices, Page 268

New York — Ferromanganese shipments are counted on to increase this month, but sellers hesitate to predict that the movement will be heavier than in November, best month of 1938. Prices are unchanged at $92.50, duty paid, Atlantic and Gulf ports, the level reaffirmed early in December for first quarter. Domestic spiegeleisen, 19 to 21 per cent, also is steady at $28, Palmerton, Pa., with 26 to 28 per cent $33. With steelmaking expected to recover this month, spiegeleisen shipments are thought likely to tend upward. Prices of other leading ferroalloys are unchanged.

Pig Iron

Pig Iron Prices, Page 268

Pittsburgh — There are no indications as to probable gains in January pig iron specifications. Inquiries are few. December pig iron production for the district was off from November, although there has been no change lately in number of furnaces blowing, 17 being active. Coke production recently has tended upward slightly.

Cleveland—Pig iron producers re-

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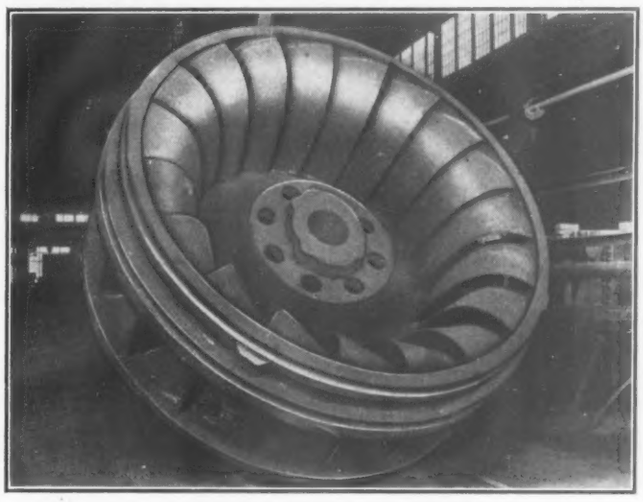

45,000 lb. Runner Casting for Hydro-Electric Plant

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port shipments during December were moderately below November. However, this was primarily due to the holidays, because in the first 20 days releases remained on a par with November. Early predictions for January indicate shipments will exceed December and might also be larger than November, best month of 1938. Automobile foundries are fairly busy, but a leveling off in demand to slightly lower levels is thought likely during January. However, a pick-up in demand from agricultural equipment and miscellaneous jobbing foundries is expected to more than offset this slight decline in requirements from auto foundries. Otis Steel Co., Cleveland, added another blast furnace recently. This brings the total in operation in the Cleveland-Lorain district to 9 out of 13.

Chicago — While December pig iron shipments showed a small drop below November, because of a slackening the past week, an increase is anticipated for January. There is a possibility that deliveries this month will exceed those of November, best period of 1938, in view of expected gains in foundry operations.

New York — Pig iron sellers look for improved demand after the middle of January. Present trading is slack, although shipments held up fairly well in December. Some recent Scandinavian inquiry, involving lots up to 1000 tons, is reported to have been placed with Continental producers. Little new business from abroad now is being figured.

Philadelphia — January specifications probably will show improvement over December, although little betterment is expected the next two weeks, because of inventory-taking.

Buffalo—Pig iron producers are bullish over prospects. Shipments for December were down approximately 15 per cent from the previous month, due entirely to customary seasonal factors. Eight of the district's 15 blast furnaces remain in operation.

Cincinnati — Rewritten contracts will cover needs of many pig iron consumers during first quarter. This condition has restricted new business ever since covering before the price increase.

St. Louis — Shipments and consumption tapered last week, but December deliveries were slightly ahead of November. New business is limited to small lots for prompt delivery, melters showing little interest in forward coverage. Most foundries already are covered by iron on hand or under contract.

Toronto, Ont. — Sales dropped sharply last week, but first quarter inquiries are fairly good and increased demand is expected shortly with the completion of the holiday and inventory periods. The daily melt, while down for the week, will recover this week.

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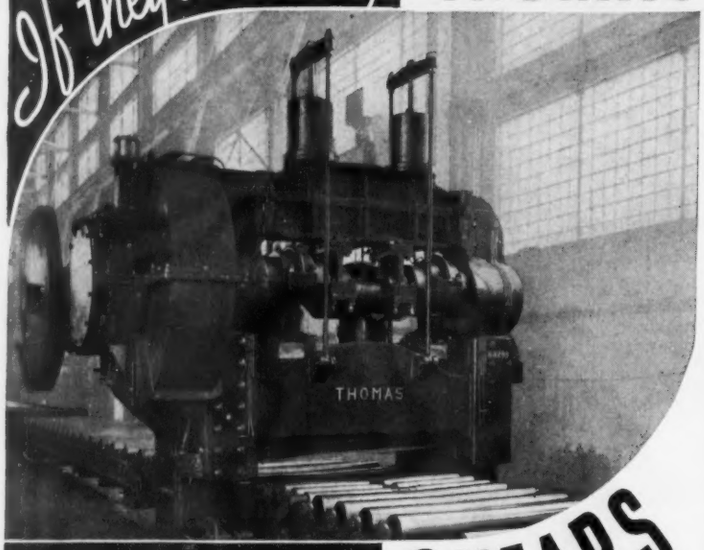

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Scrap

Scrap Prices, Page 270

Pittsburgh—Scrap is quiet but is resisting any tendency toward weakness. Prices are unchanged, having shown only slight fluctuations the past month. Shipments continue to some points, with down-river mills still taking delivery on open-hearth grades at prices within the quoted range. Aside from this, new buying is light and some mills have held up shipments against previous orders. Scrap supplies here are ample for the present but are insufficient to cover the district's needs under active market conditions.

Chicago — Market dullness resulting from year-end influences was intensified by low temperatures which restricted yard activity.

Heavy melting steel continued strong the past week despite absence of active demand. The market for No. 1 steel nominally is $13.50 to $14, with brokers generally paying the higher figure. Improved demand is expected to accompany an upturn in steelmaking this month.

New York — Japan has bought 150,000 tons of No. 1 and No. 2 heavy melting steel at $15 to $15.25 and $14 to $14.25, respectively. Japan has been purchasing approximately this tonnage for each of the past several months and is understood to be scheduling similar purchases for at least the next six months.

Philadelphia—Scrap is easier, No. 1 heavy melting steel now holding at $15 to $15.50 and No. 2 at $13 to $13.50. Stove plate and railroad malleable also are easier. Weakness is attributed in part to lower figures on recent heavy export sales to the European cartel. Some collectors accumulating tonnage for foreign shipment in anticipation of higher prices are offering scrap more freely and some domestic business has been done in both grades of heavy melting at the lower end of both ranges. Edward G. Budd Mfg. Co. is offering a monthly accumulation of bundled scrap, about 4000 tons.

Buffalo — Scrap has been marking time, awaiting developments after the start of the new year. Sentiment tends to be bullish, the anticipated upturn in ingot production being counted on to be accompanied by heavier demand for scrap. Consumers' stocks have been pared in recent weeks, but are not unusually low. In the absence of sales, prices are mostly nominal, with No. 1 heavy melting steel $13.75 to $14.25.

Cincinnati — Some material has been moving to mills against orders, but the general tendency among scrap consumers lately has been to cut inventories. Meanwhile, prices are unchanged, while the trade awaits anticipated revival in consumer buying this month.

St. Louis — Typical year-end conditions have prevailed recently. Sales have been scant, with prices irregular and partly nominal. Compressed sheets are easier, but heavy melting steel is strong as a result of a number of inquiries which are expected to close before mid-January. One important consumer, out of the market for many months, is believed ready to buy 10,000 to 12,000 tons of heavy melting.

Toronto, Ont. — Scrap trading lately has been desultory because of the holidays, with revival expected this week. Yards are fairly well stocked in most grades, although only a few dealers report holdings of heavy melting steel and machinery cast.

Warehouse

Warehouse Prices, Page 269

Cleveland — Shipments out of warehouse declined further last week, but this was anticipated. Shipments during December were off slightly from November. Some improvement is predicted for January. Prices are firm.

Philadelphia — Warehouses are confident of a January pickup in line with the usual seasonal trend. December business reflected holiday influences but proved more active than anticipated. Prices are steadier.

Cincinnati — Declining sales late in December brought the month's total slightly below November, but demand was sustained better than was expected. Some inquiries for building materials are appearing,

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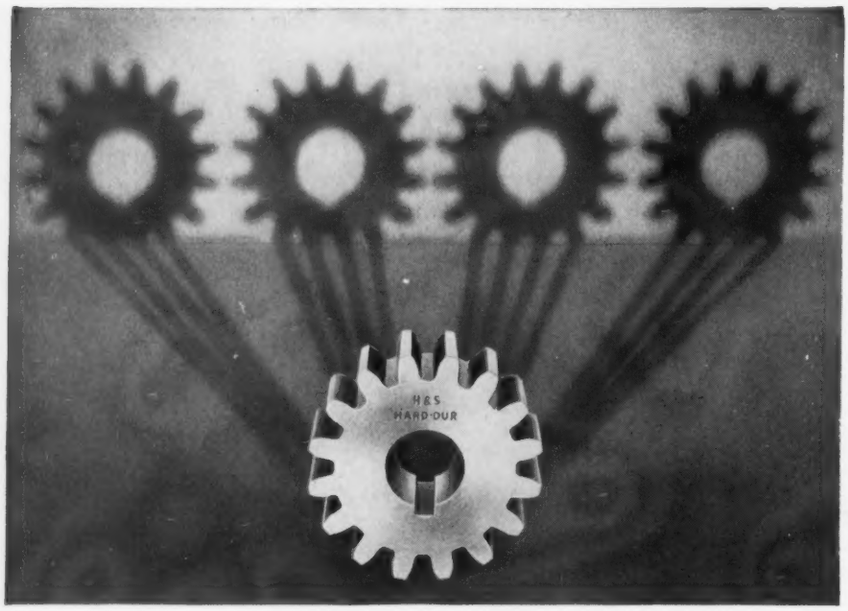
and requirements of coal mines are well sustained.

Chicago—Sales declined less than was expected, a fair volume being maintained in spite of holiday losses. December business compared favorably with November, generally the best month of last year.

Buffalo—Business in December was about on par with the previous month. This was due to a pickup the first two weeks as demand in the latter half reflected the customary seasonal falling off.

St. Louis — Sales showed less than the usual holiday slump, with general manufacturing demand holding up surprisingly well and railroads ordering fair tonnages of shop supplies. Oil country goods continues to move actively to Illinois and Arkansas fields.

Seattle—Although business sagged during the holidays volume for the month exceeded that of November and jobbers go into the new year with increased hope. Prices in Washington are generally maintained although cutting in Portland territory continues.



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Steel in Europe

Foreign Steel Prices, Page 269

London — (*By Cable*)—The British steel market is quiet over the year end but increasing interest and larger inquiries justify a favorable forecast for the beginning of the new year. Wrought iron prices have been reduced 10 shillings. Pig iron and steel output is expected to expand and preparations are being made for relighting some furnaces. New Zealand has placed a substantial order for locomotives.

The Continent reports signs of reviving activity in export markets, with American competition reappearing. Prices remain firm.

FRENCH STEEL PRICE TO BE PUT ON HIGHER LEVEL

Higher prices on steel and iron products are expected to be put in effect in France early in 1939. Through 1938 they were practically unchanged, due principally to strong pressure by the government.

New decrees by Premier Deladier now make it possible for a reasonable advance to be put in effect. Producers are asking a higher schedule and the Comptoir Siderurgique has applied for authorization to raise prices of products under its control.

Previous advances always have been less than asked. Producers claim that insufficient weight has been given to amortization and renewal of equipment. A technical committee has been appointed to determine the influence of recent growth in production costs.

Its recommendation is for an increase of 258 francs per ton for merchant bars but as this is about 55 per cent of the present price it is out of the question. An advance of 125 to 150 francs is expected to meet approval of the control committee, with 150 francs for plates.

It appears some producers do not favor higher prices but believe means should be found to increase production. In the present organization of the industry, to make allowance for producers less well equipped, higher prices are generally considered necessary.

Iron Ore

Iron Ore Prices, Page 270

Baltimore—A total of 120,858 tons of iron ore was received here from abroad from Nov. 23 to Dec. 16, inclusive. Also received during that period were 43,650 tons of manganese ore; 4112 tons of chrome ore and 2045 tons of ferromanganese.

Iron ore shipments included 11,-

300 tons from Cruz Grande, Chile, Nov. 28; 21,000 tons, Cruz Grande, Nov. 29; 21,600 tons, Cruz Grande, Dec. 1; 10,500 tons, Daiquiri, Cuba, Dec. 3; 7150 tons, Narvik, Sweden, Dec. 7; 21,000 tons, Cruz Grande, Dec. 6; 7107 tons, Narvik, Dec. 16; and 21,200 tons, Cruz Grande, Dec. 16.

Manganese ore arrivals were composed of 8000 tons from Durban, Nov. 27; 6000 tons, Santiago, Cuba, Nov. 26; 8000 tons, Poti Russia, Nov. 30; 8200 tons, Takoradi, West Africa Dec. 9; 5100 tons, Santiago, Dec. 12; and 8350 tons, Takoradi, Dec. 14.

Chrome ore arrivals included 1112 tons from Laurenco Marques, Portuguese East Africa, Nov. 23; and 3000 tons, Nuevitas, Cuba, Nov. 26.

Sees 1939 Equipment Well Ahead of 1938

Indications are that purchases of new machinery and production equipment in 1939 will be well ahead of 1938 as the result of improved general business conditions, according to Ford Lamb, executive secretary of the American Society of Tool Engineers, Detroit.

"Most mass production industries, such as automotive, normally place orders for new machinery and equipment in the spring and early summer months," he said. "Last year indications were that $65,000,000 would be spent for new equipment. Some of these purchase programs were subsequently suspended and they may form a part of 1939 buying, in addition to purchases for modernization of plants."

Equipment

Chicago — Machine tool sales have diminished somewhat because of holiday and seasonal influences. Consistent demand till late in December, however, encourages sellers to expect early resumption of the upward trend. Market retains a firm tone in spite of slight let-up in volume of inquiries, while several large lists still pend.

Cleveland — Machine tool and equipment sales slowed after Christmas as was expected by most dealers. A considerable volume of pending business, however, is expected to be closed early this year although trade views for the year as a whole vary widely. Last year's business was far from satisfactory, generally being estimated from 50 to 60 per cent under 1937, a good year. Several navy contracts were awarded Ohio builders last week, including: $143,225 for planers to General Machinery Corp., Niles Tool Work division, Hamilton; $14,213, shears, Cincinnati Shaper Co., Cincinnati; $5198, lathe, American Tool Works Co., Cincinnati.

Seattle — Demand for electrical equipment, largely from public works sources, continues active. Automotive machinery, mostly for road projects, is also moving well. Bonneville administration has received bids for circuit breakers for seven substations in Oregon and Washington. Same office has called bids Jan. 6 for machinery trailer and Jan. 16 for 115 and 196 KV disconnecting switches. Tacoma has received bids for furnishing sodium vapor lighting system. Puget Sound navy yard has opened bids for 230,000 feet of conductor cable and Jan. 4 and 6 takes bids for switchboards and equipment, Jan. 10 for chain hoists; Jan. 4 for four 125-volt DC circuit breakers.

Pierce county, Wash. has purchased two bulldozer tractors, Kitsap county, Washington, bids Jan. 6 for diesel track-type tractor. Spokane, Wash. opened bids Dec. 29 for two snow plows.

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PRODUCTION

■ STEELWORKS operations last week were lower at all centers except two, losses ranging from 3 to 25 points, due to the holidays. The rate is estimated at 40 per cent, with probability of a higher figure for this week, as resumption will be general.

Buffalo — Two open hearths dropped by Republic Steel Corp. lowered the rate 4.5 points to 39.5 per cent.

Cleveland—Unchanged at 50 per cent, the Monday schedule not having been interrupted.

New England—Steady at 70 per cent.

Youngstown, O.—Off 13 points to 32 per cent, a sharp reduction caused by holiday shutdowns.

St. Louis—Banking of three open hearths caused a loss of 9 points, from 51.5 to 42.5 per cent. The idle furnaces are to be relighted early in the year.

Chicago—Three leading producers curtailed operations because of the holiday and the rate dropped 10.5 points to 46 per cent.

Cincinnati—Shutdown for Christmas by one interest cut the rate 25 points to 50 per cent. The former rate is expected to be resumed this week.

Birmingham, Ala.—Down 5 points to 77 per cent, from the revised figure of 82 per cent for the preceding week. One open hearth has been taken off, leaving 17 in production.

Detroit—Loss of a full day's production lowered the rate 11 points to 79 per cent, although at the week end 23 to 25 open hearths were active. One producer was to shut down New Year's day but the others were to operate through.

Pittsburgh—Down 14 points to 26 per cent because of holiday interruption. The same rate is planned for this week.

Wheeling—The shorter week lowered production 9 points to 50 per cent, though the number of open hearths has not been changed.

Central eastern seaboard—Decline of 3 points to 29 per cent resulted from holiday observance. Resumption at 32 per cent is scheduled for this week.

Tennessee Restores Full-Time Salaries

■ In line with the policy of all manufacturing and mining subsidiaries of the United States Steel Corp., Tennessee Coal, Iron & Railroad Co. Jan. 1 restored full-time salary, based on 5½ days a week, to those salaried employes whose duties require them to work the full work week. Those whose work does not require the full 5½ days will be paid on a part-time basis. In the case of salaried executives, full-time pay will not be restored at this time.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Dec. 31	Change	Same week 1937	Same week 1936
Pittsburgh	26	—14	15	77
Chicago	46	—10.5	22.5	77
Eastern Pa.	29	— 3	30	52
Youngstown	32	—13	14	78
Wheeling	50	— 9	19	92
Cleveland	50	None	18	77
Buffalo	39.5	— 4.5	16	84
Birmingham	77	— 5	63	74
New England	70	None	19	75
Cincinnati	50	—25	36	92
St. Louis	42.5	— 9	15	80
Detroit	79	—11	33	100
Average	40	—12	21	79

Tin and Plate Output Shows Heavy Decline

■ World tin production in the first ten months of 1938 amounted to 127,900 tons; 164,200 in the like period of 1937. World apparent tin consumption was 129,400 tons, compared with 166,500 tons in the 1937 period, according to the International Tin Research and Development council, New York.

The three chief consuming countries, United States, United Kingdom and Russia, show decreases in consumption of 42, 26 and 34 per cent, respectively. Increases were made in Sweden 61 per cent, Japan 34 per cent, Italy 33 per cent, Germany 15 per cent and other countries 1 to 7 per cent.

Tin plate production declined 35 per cent, from 3,689,000 tons to 2,399,000 tons in the ten months. United States dropped 45 per cent from 1,870,000 tons to 1,031,000 in apparent tin plate consumption. United Kingdom dropped 36 per cent, from 407,200 to 259,000. Germany showed a gain of 3 per cent from 106,300 to 109,800.

Pratt & Whitney Award Service Pins to 794

■ Pratt & Whitney, division Niles-Bement-Pond Co., Hartford, Conn., last month awarded service pins to 794 employes, almost 45 per cent of the approximately 1800 employes.

Four men were given 50-year pins, carrying a large diamond; 27 received 40-year pins with three diamonds; 55 were awarded 30-year pins with two diamonds; 272 received 20-year pins with one diamond; 389, 10-year pins of heavy solid gold.

Forty-seven women received pins —33 in the 10-year class and 14 in the 20-year group.

During the 79 years' history of Pratt & Whitney, there have been cases of several generations of the same family on the payrolls. Total service of the four men receiving 50-year pins aggregates 235 years. Recipients: Flavel W. Woodworth, 71 years; Wilbur M. Gladding, 57 years; John F. Galvin Sr., 53 years; Henry C. Stevenson, 53 years.

Nickel Consumption Off 16 Per Cent

■ World consumption of nickel in all forms during the first ten months of 1938 amounted to approximately 168,000,000 pounds. This is a decrease of about 16 per cent from the record of 201,000,000 pounds in the corresponding period of 1937 and is comparable with the consumption rate in 1936. The decrease was due largely to the abrupt drop in business in the United States in the last half of 1937 and first half of 1938, according to a review by the International Nickel Co. of Canada Ltd.

Estimates of United States consumption for the last six months of 1938 indicate definite improvement in this market, which normally takes half the total output. European and other markets continue relatively steady.

Although this is the first recession in an advance beginning in 1932, when ten months' consumption was 27,500,000 tons, the percentage drop in nickel is believed to be considerably less than in world business as a whole.

An estimate of purposes to which nickel was put in 1938 credits steels with 60 per cent, including structural, stainless, corrosion and heat resisting steels and steel castings. Nickel cast iron absorbed 3 per cent, nickel-copper alloys and nickel silvers 14 per cent, monel and similar metals 9 per cent, with others in smaller proportion.

Schwab and Grace on Radio "Amateur Hour"

■ Steel, steel men and a steel city had a prominent spot on Major Edward Bowes' amateur hour last week.

Charles M. Schwab, chairman, Bethlehem Steel Corp., sent a Christmas greeting to listeners, predicting "happier and more prosperous times than we have ever had."

Eugene G. Grace, president, was introduced as a guest in the studio, and Miss Ethel Dutt, lyric soprano and bookkeeper in the Bethlehem plant, appeared as honor city representative when the major saluted Bethlehem.

Major Bowes devoted his commercial message to the dependence Chrysler puts upon Amola steel, perfected by C. Harold Wills.

A.S.M. Is Purchasing Own National Headquarters

■ American Society for Metals is consummating the purchase of a permanent home for its national headquarters in Cleveland. Under authorization of the board of trustees, the society is acquiring a 24-room 3-story stone residence near the present office at 7016 Euclid avenue at a cost of approximately $45,000. Although the property will not be occupied until Jan. 1, 1940, it will be taken over during the coming year and altered to make it adaptable to society needs.

Affording about three times the present office space, the new headquarters will not only meet future national office requirements but will care for the collection and storage of the society's property now scattered. The added space also will provide a conference room for out-of-town members. The society will occupy the building exclusively.

Lower Stocks Presage Better 1939 Auto Output

■ Restrained optimism appears to be the keynote of expressions from leaders in the automobile industry regarding 1939.

K. T. Keller, president of Chrysler Corp., says: "There is good reason now to estimate the 1939 production range between 3,000,000 and 3,500,000 vehicles.

"Dealers' stocks of cars are now lower than they have been at this season for some years past. There appears to be no serious inventory problem, and the encouraging rate of production reflects, in large measure, the actual movement of new cars into consumers' hands."

Nicholas Dreystadt, general manager, General Motors' Cadillac division, states: "Developments since introduction of new models have strengthened the auto industry's opinion that the forthcoming year will score a strong improvement over 1938.

"There is more inclination to raise original sales and production estimates than to lower them. The active fall retail market brought about several increases in schedules, yet we will enter the new year with dealer stocks lower than a year ago."

Paul G. Hoffman, president, Studebaker Corp., South Bend, Ind., observes: "Stocks of unsold new and used cars are approximately 50 per cent of what they were a year ago, and the rate of retail sales is substantially higher."

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1936	1937	1938
Jan.	377,244	399,186	227,130
Feb.	300,810	383,900	202,589
March	438,943	519,022	238,598
April	527,625	553,231	238,133
May	480,518	540,377	210,183
June	469,368	521,153	189,399
July	451,206	456,909	150,444
Aug.	275,934	405,072	96,936
Sept.	139,820	175,630	89,623
Oct.	230,049	337,979	215,296
Nov.	405,799	376,629	390,350
Dec.	518,958	347,349	*412,000
Year	4,616,274	5,016,437	*2,660,681

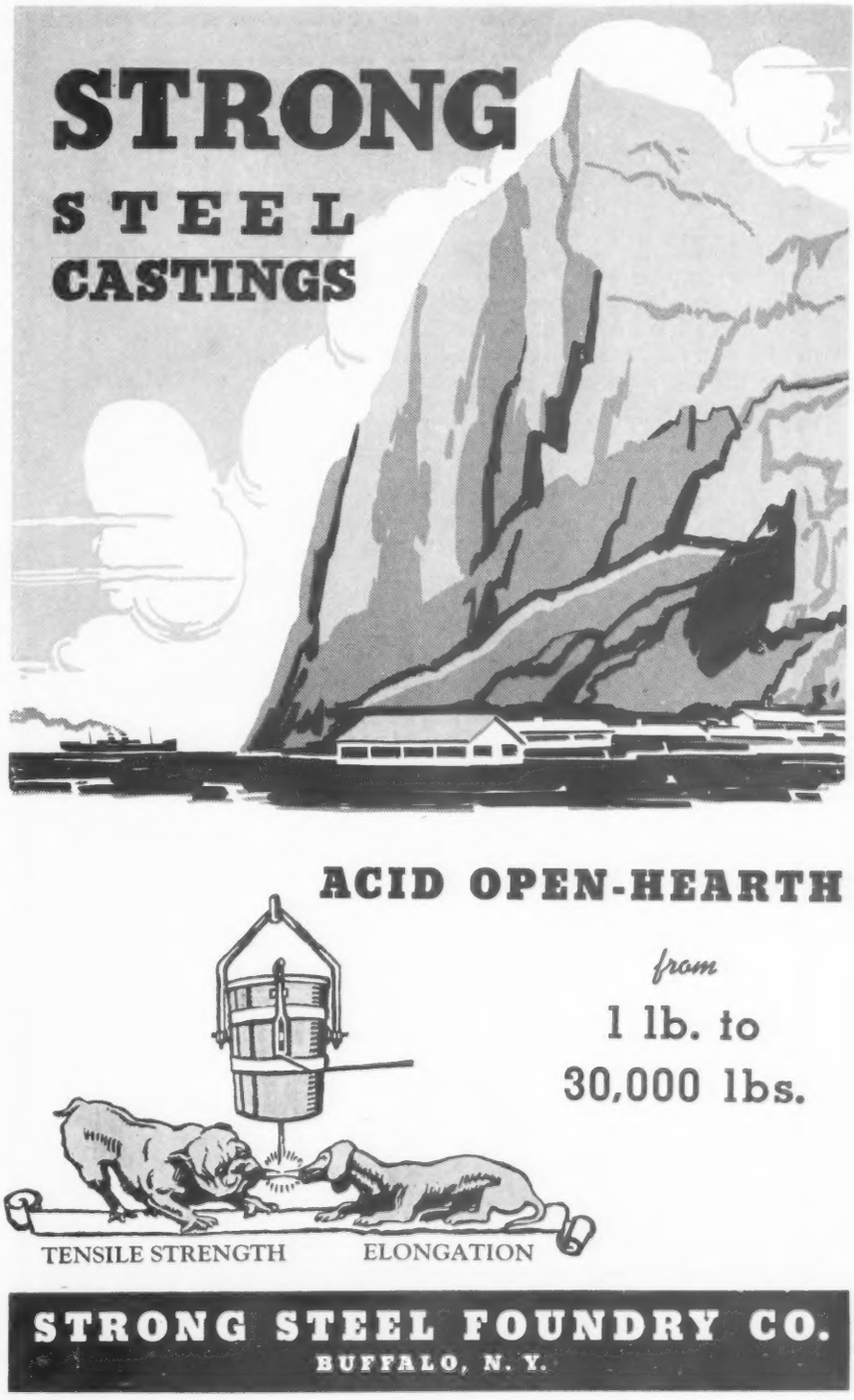
*Estimated.

Estimated by *Ward's Reports*

Week ended:	1938	1937†
Dec. 3	97,795	86,848
Dec. 10	100,705	85,765
Dec. 17	102,905	82,025
Dec. 24	92,890	67,230
Dec. 31	77,415	49,550

†Comparable week.

	Week Ended Dec. 31	Dec. 24
General Motors	33,330	38,875
Chrysler	21,960	21,960
Ford	17,140	22,200
All others	4,985	9,855



9-Year Earnings Average 1.5%

■ STEEL industry earnings for the past nine years have averaged only 1.5 per cent annually on the industry's capital investment, according to a year-end statement by Walter S. Tower, executive secretary, American Iron and Steel institute. In the decade from 1920 through 1929, the return averaged 5.5 per cent.

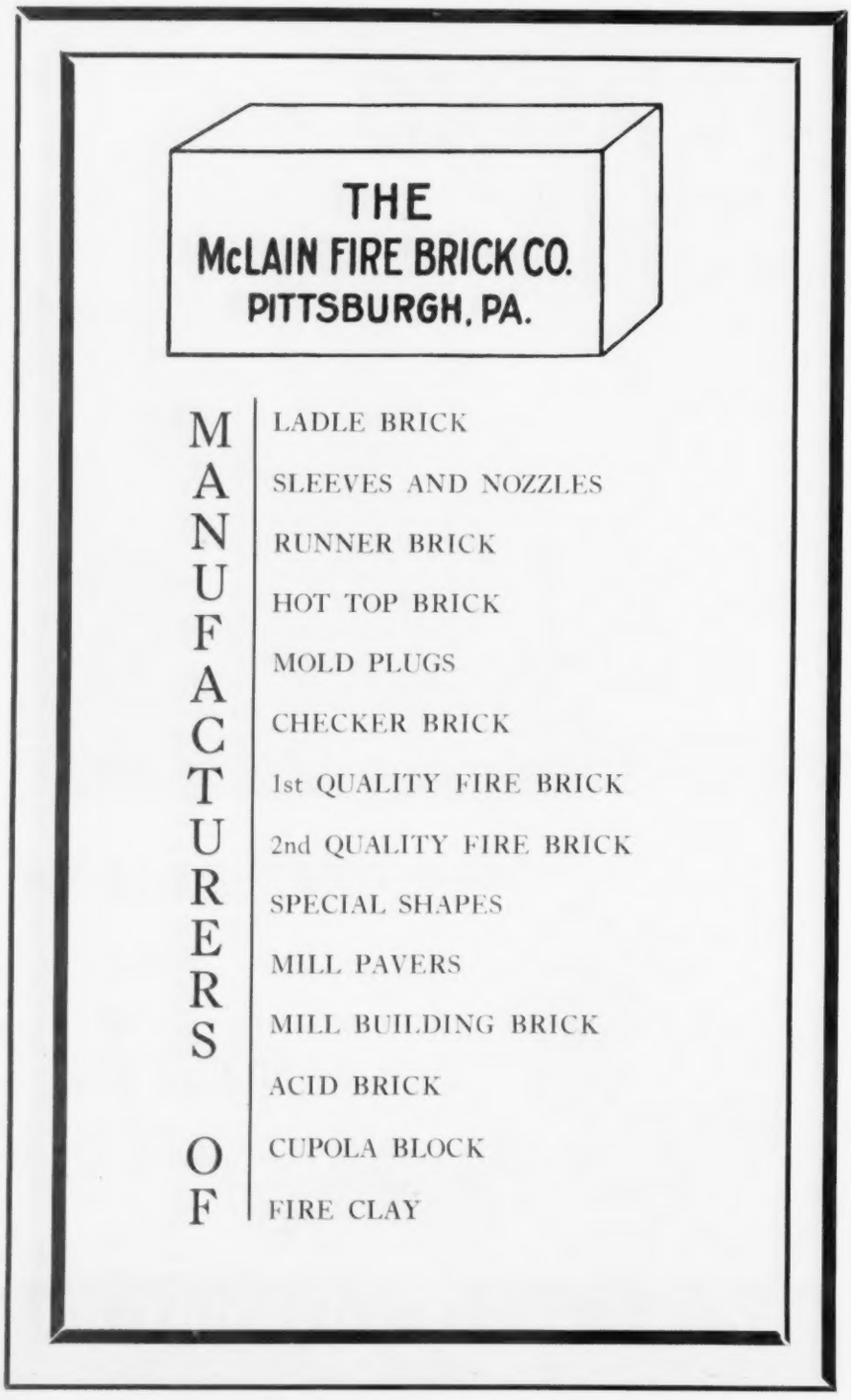
The 1938 operating rate approximated 40 per cent of capacity, said Mr. Tower, adding that 1939 appears likely to close the only decade in modern history in which no new high yearly production was recorded.

Average number of wage earners on the industry's payrolls for the first nine months last year was 385,000, compared with 521,000 in the corresponding period of 1937, when employment established a record. Before the close of 1938, however, the tide of employment had turned and additions to payrolls were reported during the final quarter. Wage rates continued at the highest level in history.

Total payrolls in 1938 exceeded $600,000,000, compared with $976,083,000 in 1937, an all-time record.

Steel companies continued to spend large sums for modernization and improvement of productive equipment, Mr. Tower points out. The industry allocated approximately $165,000,000 for this purpose during the year, largely for finishing facilities. This made the total for such expenditures for the four years from 1935 through 1938 approximately $840,000,000.

"As a result it is probably safe to say that at the end of 1938 the steel industry's plants were in better condition to take care of a large volume of business at lower prices for higher quality products than ever before."



Bethlehem To Contest Examiner's Finding

■ Bethlehem Steel Co. last week announced it will contest findings of a national labor relations board examiner. The examiner, Frank Bloom, recommended existing organizations for collective bargaining by Bethlehem's employes be disestablished and that the company cease alleged interference with the rights of employes to join independent unions.

Eugene G. Grace, Bethlehem president, replied the company's employes "have continuously shown their desire that those organizations be continued. We intend, therefore, to contest the findings of the report. They are not supported by the facts and are contrary to the intent of the labor act."

The company maintains employe representatives "have each year been freely chosen," that there is "no evidence in the record . . . which shows any interference or coercion, and that in the past two elections respectively 96 and 93 per cent of the available employes voted for the plans."

Mr. Grace commented the examiner had disregarded the plans' accomplishments. "Apparently to him the wishes of 100 per cent of the employes are without significance.

"The report of the examiner makes no constructive suggestion as to how to avoid the chaos that would follow disestablishment of the present plans, nor does he suggest that the wishes of the employes be ascertained."

Forecast Increase in Steel Carloadings

■ Shippers' advisory boards have estimated carloadings of iron and steel for the first quarter of 1939 will be 303,191, compared with actual carloadings of 218,032 for first three months in 1938.

Fabricators See Increase From Public Construction

■ Fabricated structural steel production for the first 11 months of 1938 was 1,077,000 tons and for the year will amount to at least 1,200,000 tons, estimates the American Institute of Steel Construction, New York. Production in 1937 was 1,628,641 tons.

New contracts being received indicate consistently increasing business for the next 12 months. This expectation is based on the new public works program, estimated to require 750,000 tons in 1939 and 1,000,000 tons by July 1, 1940.

Public construction normally would account for but a small part of total fabricated structural steel business. In the past few years it has amounted to as much as two-fifths of the total.

The institute also cites commerce department estimates for increases of 40 per cent in shelter buildings, 30 per cent in factory buildings, 15 per cent in commercial buildings, 20 per cent by utilities.

These increases, it points out, are from the lows established in 1938. If all were realized the volume of business during 1939 would not be much above the average of the years 1931-38.

E.D. Clapp Mfg. Co. Marks Seventy-Fifth Year

■ E. D. Clapp Mfg. Co., Auburn, N. Y., drop forging manufacturer, will celebrate its seventy-fifth anniversary this month. Founded in January, 1864, as E. D. Clapp & Co., by Emerous D. Clapp, it has been owned and managed by three generations of his family.

It was incorporated as E. D. Clapp Mfg. Co. in July, 1876. The founder was president until his death, June 1, 1889; followed by his son, Delamer E. Clapp, until his death, Feb. 11, 1929. E. D. Clapp, son of the latter, succeeded to the presidency, a position he still holds. H. W. Clapp is vice president and Edward A. Clapp, who is president of the Pyrene Mfg. Co., Newark, N. J., is assistant treasurer. The company is believed to be the oldest drop forging concern in the country continuously owned by one family.

Emerous D. Clapp sent to England about 1854 for a so-called drop or stamping hammer to use in his wagon works at Ira, N. Y. A crude tool, it was refined and improved and others built. Success of this better product was followed by formation of the company to make forgings for horsedrawn vehicles, which still are an important part of its output. Until about 15 years ago the company built its own hammers.

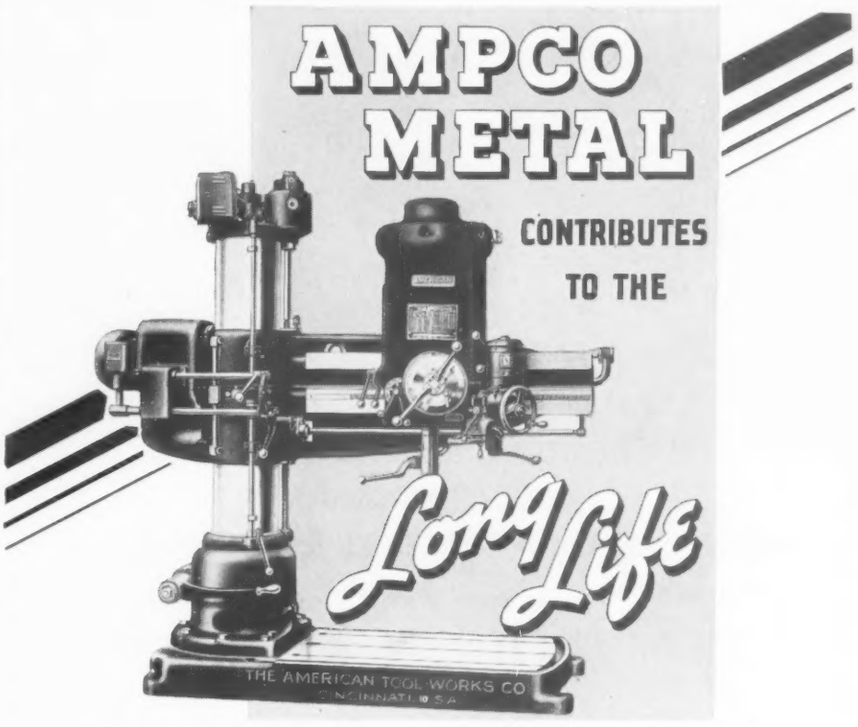
The first special forgings made by the company were musket parts for the Northern army in the Civil war. Beginning in the early eighties, bicycle forgings were produced. In 1899 it made the first automobile forgings and in 1917 the first airplane forgings.

The company is well equipped not only for the production of small and medium size forgings in carbon, alloy, tool, corrosion resisting and other special steels, as well as nonferrous metals, but maintains a large machining department for finishing its products.

■ Metals section, National Safety council, Chicago, has announced as a new member California Cornice, Steel & Supply Corp., 1600 North Spring street, Los Angeles.

Plans New Radio Series

■ American Rolling Mill Co., Middletown, O., will start a new series of "Ironmaster" radio programs Jan. 15 over 42 stations. Keynoted by "What industry means to the average man and his family," the talks will interpret the advantages of free individual enterprise and the American competitive system, in simple graphic language.



OF AMERICAN RADIALS

AMERICAN Radials have an enviable reputation for long productive life and precision performance. Engineers of the American Tool Works Company, builders of American Radials, specify Ampco Metal for elevating nuts, because only Ampco Metal provides the qualities of wear resistance and long life required to protect the vital elevating mechanism of these tools. Ampco Metal is the invariable choice of machine tool builders for extreme service parts where resistance to wear and maintained accuracy are essential.

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MEETINGS

SCRAP INSTITUTE READY FOR ST. LOUIS CONVENTION

■ INSTITUTE of Scrap Iron and Steel Inc. has completed the program for its eleventh annual convention at Hotel Jefferson, St. Louis, Jan. 10-12. A series of addresses and papers will appraise the present status of the scrap industry and prospects for the future. Institute affairs will be reviewed by President Michael V. Bonomo, Schiavone-Bonomo Corp., New York, and Edwin C. Barringer, New York, the executive secretary of the institute.

Addresses scheduled: "A Steel Executive Looks at His Business," by William H. Colvin Jr., president, Rotary Electric Steel Co., Detroit; "Trend Toward Lighter Grades of Scrap," by Mr. Barringer; "Suggested Revision of Competitive Practices," by S. H. Bassow, Bassow Bros., New York; "Saving Through Safety," by Joseph Colvin, secretary, Scrap Materials Service Corp., New York; and "Industry—Its Opportunity and Responsibility," by Louis J. Borinstein, A. Borinstein, Indianapolis.

Joseph E. Jacobson, Luria Bros. & Co. Inc., Pittsburgh, will lead an open forum on "Streamlining for Service and Profits." Mr. Bassow will preside at a conference on baling on the opening day, preparatory to formation of the Scrap Balers' association.

1939 METAL CONGRESS AND SHOW IS ONE WEEK LATER

American Society for Metals announces that the date of the 1939 National Metal congress and exposition to be held in Chicago has been changed from Oct. 16-20 to Oct. 23-27.

Convention Calendar

Jan. 9-13—Society of Automotive Engineers. Annual meeting at Book-Cadillac hotel, Detroit. John A. C. Warner, 29 West Thirty-ninth street, New York, is general manager.

Jan. 10-12—Institute of Scrap Iron and Steel. Eleventh annual convention at Hotel Jefferson, St. Louis. Edwin C. Barringer, 11 West Forty-second street, New York, is executive secretary.

Jan. 12-14—American Engineering council. Nineteenth annual meeting at Mayflower hotel, Washington. F. M. Feiker, 744 Jackson Place N. W., Washington, is executive secretary.

Jan. 22-27—Canning Machinery and Supplies association. Annual convention at Stevens hotel, Chicago. S. G. Gorsline, Box 430, Battle Creek, Mich., is secretary.

Jan. 23-26—American Society of Heating and Ventilating Engineers. Annual meeting at William Penn hotel, Pittsburgh. A. V. Hutchinson, 51 Madison avenue, New York, is secretary.

Jan. 23-27—American Institute of Electrical Engineers. Winter convention in New York. H. H. Henline, 33 West Thirty-ninth street, New York, is secretary.

Jan. 24—Canning and Packing Machinery institute. Annual convention at Stevens hotel, Chicago. E. G. Vail, 205 West Wacker drive, Chicago, is secretary.

Government Steel, Iron Awards Total $997,264

■ Government purchases of iron, steel and their products for the week ended Dec. 17 under the Walsh-Healey act totaled $997,264.48, as follows: Bridgeport Thermostat Co., Bridgeport, Conn., $114,800; Crucible Steel Co. of America, New York, $162,449.51; National Tube Co., Pittsburgh, $160,000; Bethlehem Steel Co., Bethlehem, Pa., $227,550; Midvale Co., Washington, $29,646.70; Steel Improvement & Forge Co., Cleveland, $16,818.50; William R. Bootz, successor to Crescent Stove Works, Evansville, Ind., $24,152; Russakov Die Casting Co., Chicago, $14,062.50; A. Finkl & Sons Co., Chicago, $23,172.50; Truscon Steel Co., Newark, N. J., $22,074; Carnegie-Illinois Steel Corp., Washington, $60,000; Central Iron & Steel Co., Harrisburg, Pa., $105,000; Stupp Bros. Bridge & Iron Co., St. Louis, $19,871; Washington Corrugated Culvert Co., Spokane, $17,667.77.

WIRE

Round + Flat + Square
Straightened and Cut
Shape Wire

+

HIGH CARBON SPRING
LOW CARBON BASIC AND BESSEMER
OIL TEMPERED
WELDING WIRE RODS AND COILS

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Sizes ½" to No. 40 WM Gauge (.007)—All Finishes

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Wire for Practically All Purposes
and Requirements
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+

Highest Quality and Service Guaranteed

+

Established 32 Years

The Seneca Wire & Mfg. Company
Fostoria, Ohio

Representatives and Warehouses in practically all principal cities

What Customers Mean To Employes Explained

■ Holding customers and getting new ones, the job of every officer and employe, is stressed in a letter to the entire organization by R. E. Falk, vice president and general manufacturing manager of Revere Copper & Brass Inc., New York. The company must produce best quality material at competitive price and give dependable service and co-operation with the buyer.

Each department has its share, Mr. Falk says, in providing means to meet customer requirements. Unless these co-ordinate, sales may be lost and without sales there is profit for none, from president down to laborer.

Bridgeport Brass Calls National Convention

■ Bridgeport Brass Co. representatives from 21 branch offices throughout the country will be called to Bridgeport, Conn., Jan. 9 for the company's first national convention in its 73-year history. Previously sectional sales conferences have been held.

Herman W. Steinkraus, sales vice president, explained the national meeting was being held to acquaint representatives with the new and improved manufacturing plants that are the result of a long-range expansion and modernization program.

Penn Metal Corp. Looks Back on Seven Decades

■ Penn Metal Corp. of Pennsylvania, Philadelphia, manufacturer of sheet metal products and equipment, celebrates its seventieth anniversary this year. L. Lewis Sagendorph founded a sheet metal business at Staunton, Va., in 1869 and in 1883 moved it to Cincinnati. Major Harlan P. Lloyd became his partner and they organized the Sagendorph Iron Roofing & Corrugating Co., selling plant and equipment in 1889 to George M. Verity and associates who changed the name to American Steel Roofing Co. and later to American Rolling Mill Co., removing it to Middletown, O.

Mr. Sagendorph then moved to Philadelphia and formed the Penn Metal Ceiling & Roofing Co. with plant at Twenty-third and Hamilton streets. It manufactured corrugated iron and steel roofing, galvanized conductor pipe and eavestrough, under patents held by Mr. Sagendorph. Other lines were added, including corrugated metal culvert pipe.

In 1920 the company moved to Twenty-fifth and Wharton streets and in 1924 bought the equipment of the Dexter Metal Mfg. Co., Camden, N. J., giving facilities for manufacture of steel lockers, shelving and office cabinets. In 1925 equipment was purchased for producing tinclad and kalamein fire doors. In 1930 a new plant was acquired at Oregon avenue and Swanson street, with sprinkler system and private railroad siding, its present location.

Bar Wage Rate Unchanged

■ Puddlers and bar mill workers' wages under the Amalgamated association scale will be maintained through January, according to S. C. Leonard, secretary-treasurer, Western Bar Iron association. Card rate will be 2.25 cents for boiling, bar and 12-inch mills, and 2.35 cents for guide and 10-inch mills. Rate has not been changed since July.

Add Tool Chapters

■ American Society of Tool Engineers will charter two more chapters within the next several weeks. One of these, at Elmira, N. Y., will take in the southern tier in New York state. The second will be chartered in Peoria, Ill. The new chapters will bring the total to 26, in the East and Mid-West. A new chapter was chartered at Moline, Ill., in December.

SIXTY-EIGHT

Brosius Automatic Motor or Hand Operated Goggle Valves

have been installed in the United States and abroad and all of them are giving excellent satisfaction.

Brosius Valves are self contained and their operation is independent of the gas line. The valve seats are renewable and flexible, allowing them to conform to any slight distortion caused by stresses in the line and maintaining a tight valve at all times.

Only 10 to 20 seconds are required for a complete cycle of a motor driven valve. Hand operation requires a proportionately greater time.

Including our earlier design, One Hundred Ten Brosius Goggle Valves have been sold in the United States and abroad.

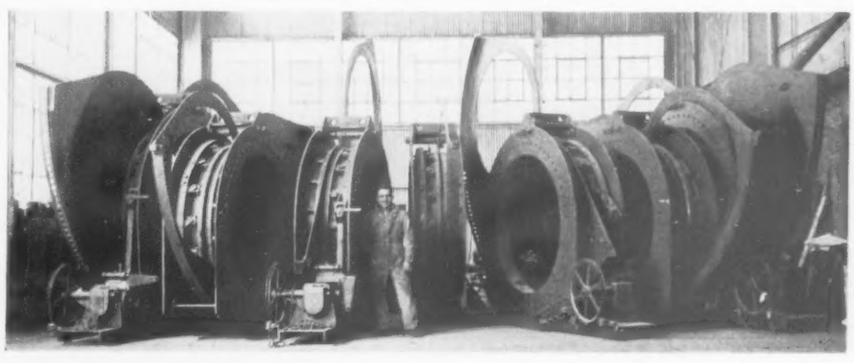
Edgar E. BROSIUS, Inc.

Designers and Manufacturers

PITTSBURGH SHARPSBURG BRANCH **PA.**

European Distributor: Dango & Dienenthal, Siegen, Westphalia, Germany

Brosius Equipment is covered by patents allowed and pending in the United States and Foreign Countries.



MEN OF INDUSTRY

■ E. G. HILL has been appointed assistant to general superintendent in charge of technological co-ordination; F. E. Mooney, assistant to general superintendent, production; and J. N. Quinlan, assistant division superintendent, West mills, all at Gary works, Carnegie-Illinois Steel Corp.

Mr. Hill in 1931 engaged in research work at Mellon institute and since 1934 has been a director of research, Lukens Steel Co.

Mr. Mooney, since 1937, superintendent of No. 2 open-hearth, Gary works, joined that works in 1923, serving as second helper, labor foreman and assistant superintendent, and in 1936 was transferred to the corporation's South works as assistant superintendent of No. 3 open hearth and bessemer.

Mr. Quinlan's entire business career in the steel industry was spent at Gary works where he started as a clerk in 1907. Until his present appointment he was assistant to general superintendent of process and control.

E. G. Hill

♦

N. Goldsmith, formerly with Simmons Mfg. Co., has joined the Arrow Muffler Co., Chicago, as sales manager.

♦

Frank E. Walling has been named superintendent of rolling, Duquesne, Pa., works, Carnegie-Illinois Steel Corp. He succeeds H. W. Boyle, resigned.

♦

D. D. Buchanan has been named manager of operations, Union Drawn Steel division, Republic Steel Corp., with offices in Massillon, O. He has been associated with Union Drawn Steel the past 15 years.

♦

C. M. Young, president, L. A. Young Spring & Wire Co., Detroit, has been elected president, Milwaukee Junction Manufacturers association. Other officers elected are: First vice president, J. E. McBridge, vice president, Palmer Bee Co.; second vice president, F. H. Winckler, superintendent, Joseph T. Ryerson & Son Inc.; treasurer, J. W. Collins, plant manager, Aluminum Co. of

F. E. Mooney

EXTRA PROFITS
IN 1939
WITH "ERIE" EQUIPMENT

"Erie" Products will help you earn extra profits in 1939 by reducing your material handling costs.

THE "ERIE" LINE COVERS:

■ Erie Buckets — the complete line (Clamshell and Dragline) for every raw or processed bulk material handling, rehandling or digging problem.

■ Strayer Electric Bucket — the electric bucket of proven performance — operating electrically in its own headroom and under positive control of the crane operator.

■ Erie AggreMeter Plants and Bins — a complete line for bulk material storage, weighing and measuring, cement plants, central mixing plants, sand and gravel bins, etc.

■ Strayer Portable Mixing Plant — a complete concrete plant. No costly setups, with minimum transportation cost. Produces quality concrete at minimum expense.

We'll gladly tell you more about any or all of these money saving products. Send for further details today.

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800 Geist Road — Erie, Pennsylvania

Erie Scraper

Strayer Electric

Erie Hook-On

J. N. Quinlan

America; secretary, George A. Sadler, manager of the association.

♦

Irvin C. Kinney has been promoted to assistant manager of sales, sheet and wire products division, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., effective Jan. 1.

Irvin C. Kinney

Mr. Kinney has been advertising manager since November, 1937.

♦

R. E. Palmer has been made sales manager, Aviation Mfg. Corp., Lycoming division, Williamsport, Pa., succeeding George J. Brew, who has become associated with the Bell Aircraft Co., Buffalo.

♦

Wade H. Oldham resigned, effective Jan. 1, as southern district manager of Republic Steel Corp., and this position is to be left vacant.

E. I. Evans, formerly general superintendent, Republic's Gulf Steel district, has been appointed manager, Gulf Steel district, with A. G. Delany as assistant. G. H. Davis becomes master mechanic and C. R. Fletcher mechanical general foreman.

C. L. Bransford, formerly general superintendent, Republic's Birmingham district, has been appointed manager of the Birmingham district.

♦

Joseph F. Heil has been appointed executive vice president, Heil Co., Milwaukee, in which capacity he has acted since his father began his successful campaign for governor of Wisconsin. Mr. Heil entered the factory in 1923 and was elected a vice president in 1931. George W. Kuhlman, with the Heil Co. since 1919, and now general manager of its eastern factory at Hillside, N. J., has been elected a vice president.

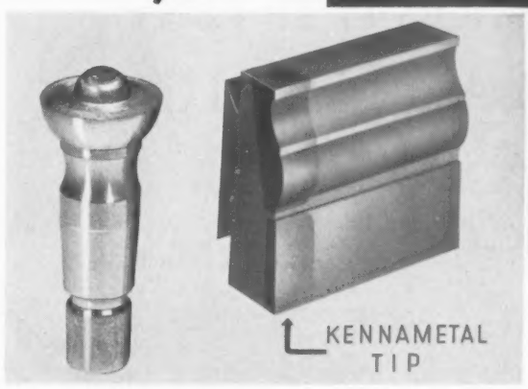
♦

G. B. Schuyler, head of western operations for Apex Electrical Mfg. Co., Cleveland, with headquarters at Oakland, Calif., has been appointed executive vice president of Apex plants. He assumed his new duties in Cleveland Jan. 1.

S. W. Taylor, director of standards in manufacturing methods, plant planning and time study for the Nash-Kelvinator Corp., Detroit, has been named vice president in

Economize With KENNAMETAL

TOOLS AND BLANKS FOR MACHINING STEEL



Only KENNAMETAL Permits

★ Machining of tough metals such as Steel, heat-treated up to 500 Brinell, while COMBINING ROUGHING AND FINISHING IN ONE OPERATION.

★ Cutting speeds two to six times greater than those of high speed steel.

★ Ten to fifty times as many pieces obtained per grind of tool.

The KENNAMETAL-tipped Forming Tool in the above photograph will turn 500 steel tie-rod pins for automobiles at the rate of 300 per hour, and has a life of 30 regrinds or 15,000 pieces. Note the metal surface structures on the right.

KENNAMETAL is harder than the hardest tool steel.

For your Convenience in Ordering
WRITE FOR THE NO. 2 KENNAMETAL CATALOG

Fig A: Section of above piece tooled with **KENNAMETAL** Form Tool. Note smooth structure. (Enlarged three times—unretouched photograph.)

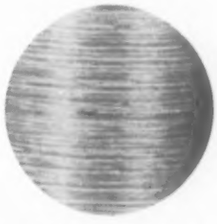


Fig. B: Unretouched photograph. Section of similar piece, tooled with ordinary Tungsten Carbide tool. Note torn structure.

McKENNA METALS Co.
200 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

charge of plant operations for the Apex company.

•

P. J. Sandmaier, formerly secretary to C. M. White, vice president in charge of operations, Republic Steel Corp., Cleveland, has been named assistant manager of orders. R. D. Schad has been made chief clerk, general order department.

•

Al H. Wheeler, who represented the American Screw Co., Providence, R. I., for ten years in eastern Pennsylvania, New York and northern Ohio, following graduation from Carnegie Tech, has joined the sales organization of Lamson & Sessions Co., Cleveland, maker of bolts, nuts, cotters and cap screws.

•

Donald Graham Clark has been appointed director of purchases, Gulf Oil Corp., Pittsburgh. He formerly was comptroller, Brown & Sharpe Mfg. Co., Providence, R. I. A graduate of Brown university and Harvard Law school, Mr. Clark is past president of both the National Association of Purchasing Agents and the Rhode Island Purchasing Agents association.

D. G. Clark

•

Charles E. Brinley has been elected president, Baldwin Locomotive Works, Philadelphia, succeeding George H. Houston, who resigned last August. Mr. Brinley is a director and member of the executive committee, and since Mr. Houston's resigned has been acting vice president with full executive powers.

William H. Harman has been elected vice president in charge of sales.

The resignation of Robert S. Binkerd as vice president and director of sales was accepted by the board.

•

Harry F. Knapp, since 1931 manager, Washington district sales office of Carnegie-Illinois Steel Corp., has been made manager of sales, special accounts, with headquarters in Washington. He has been succeeded as Washington district sales manager by Andrew J. Snow. Mr. Knapp has been associated with the subsidiary of United States Steel Corp. since 1903, when he joined the organization at its Philadelphia

Harry F. Knapp

Stearns

MAKES IT IF IT'S

MAGNETIC

SEPARATORS
DRUMS
ROLLS
CLUTCHES
BRAKES
SPECIAL MAGNETS

HIGH STEARNS DUTY

The Stearns High Duty trade mark is backed by close to forty years of practical pioneering experience. If it's a magnetic product, we know how to make and apply it.

Constant development and research by Stearns engineers, together with extensive laboratory facilities, has been responsible for much of the present day wide-spread industrial use of magnetic equipment.

Stearns products will solve your problem, whether for separation, protection, purification, reclamation, power transmission and control or special magnetic appliances. You can depend on Stearns for high maximum operating efficiency at low cost.

We invite your questions. What's your problem?

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"THE HOUSE OF MAGNETIC MAGIC"

Stearns Magnetic Mfg. Co.
(formerly Magnetic Mfg. Co.)
650 So. 28th St. Milwaukee, Wis.

LARGEST EXCLUSIVE BUILDERS
OF MAGNETIC EQUIPMENT

sales office. He went to Washington in 1915 and in 1926 was appointed assistant manager of sales.

Mr. Snow has spent his entire business career with the company since leaving Carnegie Institute of Technology in 1912, and since 1932 had been assistant manager at Washington.

♦

G. A. Park, formerly assistant sales manager, has been appointed eastern sales manager in charge of the territory east of and including

Andrew J. Snow

the Pittsburgh district for the Norton Co., Worcester, Mass.

R. M. Johnson, formerly sales engineer, has become western sales manager, in charge of the Cleveland, Detroit and Chicago warehouses and other western areas; A. G. Green, of the research laboratories, will succeed Mr. Johnson as sales engineer; W. R. Moore, as the newly-appointed general sales manager, will direct the activities of these three men.

W. T. Montague has been named assistant vice president. He will continue to supervise the staff activities of the sales department, including sales research, publicity, sales training and traffic.

DIED:

■ WILLIAM FREDERICK ROBERTSON, 77, founder and president, W. F. Robertson Steel & Iron Co., Cincinnati and Springfield, O., at his home in Cincinnati, Dec. 20. He was also president, H. L. Brown Fence & Mfg. Co., Cincinnati, and Tower Mfg. Co., Madison, Ind.

♦

William R. Seigle, 59, chairman of the board, Johns-Manville Corp., New York, Dec. 26. Mr. Seigle spent nearly 40 years in the service of the corporation and its predecessor companies.

♦

Frank Norton Hoffstot, 77, an organizer and president of Pressed Steel Car Co., from 1901 to 1933, at his home in New York, Dec. 25.

♦

Arthur M. Mattison, 57, president, Mattison Machine Works, Rockford, Ill., since 1920, in Rockford, Dec. 21.

♦

Warren Webster, 75, president and general manager, Warren Webster & Co., Camden, N. J., manufacturer of steam heating systems, in Washington Dec. 21.

♦

R. C. Danly, 66, president, Danly Machine Specialties Inc., Chicago, in Hinsdale, Ill., Dec. 15. He founded the Danly organization in 1923 and served continuously as president until his death.

♦

Frank C. B. Page, 68, former president, E. W. Bliss Co., Brooklyn, N. Y., Dec. 24 in that city. He entered the Bliss company as an office boy in 1885, retiring 50 years later.

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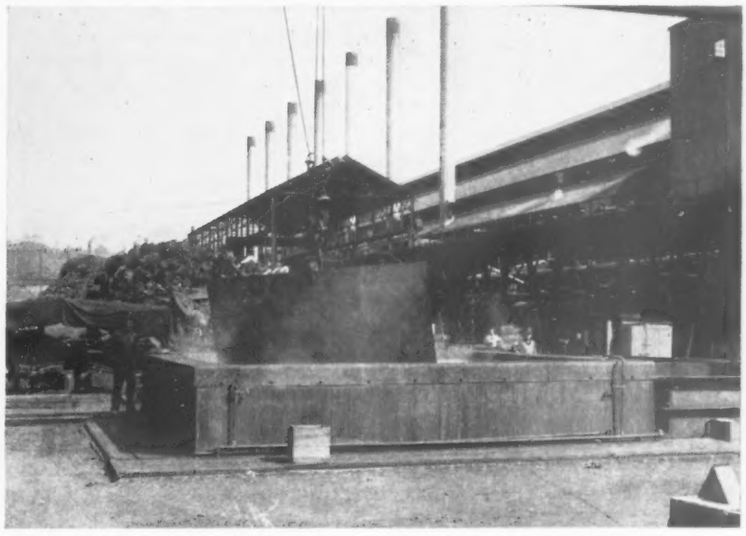

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The tank illustrated is out in the open and has been in continuous operation for 6 years without any repair expense whatsoever, and is only one of hundreds of tanks lined by the CEILCOTE method.

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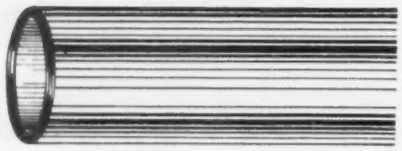

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ORDER FROM STOCK

Nonferrous Metals

New York—A stronger undertone developed in domestic nonferrous metal markets last week. While lead appeared strong due to heavy demand early in the week, copper and tin prices strengthened on advances in London.

Copper—Consumers here continued to place only routine tonnages but the outlook for the market remained promising due to heavy buying which is believed pending and curtailment of foreign production. Export copper advanced to the highest levels attained in weeks, closing at around 10.52½c, c.i.f., resulting in a further boost in bids for copper and brass scrap. Electrolytic held at 11.25c, Connecticut.

Lead — The market appeared poised for a price advance early in the week due to heavy demand but lacked support when needed of higher prices in London. Prices abroad did rise, however, but only after buying enthusiasm waned here. The domestic market held at 4.70c, East St. Louis.

Zinc—While the market was fairly quiet, sales for the week ended Dec. 17, amounting to 5369 tons, exceeded expectations. Prime western held steady at 4.50c, East St. Louis. A moderate recovery in galvanized sheet output from the current 55 per cent rate is expected after the turn of the year.

Tin—Straits tin prices advanced to the highest levels attained since mid-November with spot closing around 46.65c. Strength was attributed to heavier buying by American consumers in anticipation of a sharp pickup in tin plate operations early in 1939 which in turn strengthened the foreign market.

Antimony — Prices advanced ½-cent Wednesday on American antimony to the basis of 11.75c for spot. Buying was somewhat more active. Chinese spot held nominally unchanged at 14.00c, duty paid New York.

Tin Plate

Tin Plate Prices, Page 266

Tin plate orders increased substantially in December, principally from larger consumers, pointing to a marked upturn in production this quarter. Smaller users lately have been buying generally on a hand-to-mouth basis, but are looked to for heavier purchases later this month.

Nonferrous Metal Prices

Spot unless otherwise specified. Cents per pound

Dec.	Copper Electro, del. Conn.	Copper Lake, del. Midwest	Copper Casting, refinery	Straits Tin, New York Spot	Straits Tin, New York Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
24	11.25	11.37½	10.77½	46.25	46.40	4.85	4.70	4.50	20.00	11.25	35.00
26—Holiday.											
27	11.25	11.37½	10.77½	46.35	46.50	4.85	4.70	4.50	20.00	11.25	35.00
28	11.25	11.37½	10.77½	46.40	46.55	4.85	4.70	4.50	20.00	11.75	35.00
29	11.25	11.37½	10.77½	46.70	46.85	4.85	4.70	4.50	20.00	11.75	35.00

MILL PRODUCTS

F.o.b. mill base, cents per lb. except as specified. Copper brass products based on 11.25c Conn. copper

Sheets

Yellow brass (high) 17.31
Copper, hot rolled 19.37½
Lead, cut to jobbers 8.00
Zinc, 100 lb. base 9.75

Tubes

High yellow brass 20.06
Seamless copper 19.87½

Rods

High yellow brass 12.62
Copper, hot rolled 15.87½

Anodes

Copper, untrimmed 16.62½

Wire

Yellow brass (high) 17.56

OLD METALS

Nom. Del. Buying Prices

No. 1 Composition Red Brass

New York 6.42½-6.55
Cleveland 6.75-7.00
Chicago 6.12½-6.37½
St. Louis 6.00-6.25

Heavy Copper and Wire

New York, No. 1 ..... 7.75-8.00
Cleveland, No. 1 ..... 7.75-8.00
Chicago, No. 1 ..... 7.75-8.00
St. Louis 7.50-7.75

Composition Brass Borings

New York 5.60-5.85

Light Copper

New York 6.25-6.50
Cleveland 5.75-6.00
Chicago 6.12½-6.37½
St. Louis 6.00-6.25

Light Brass

Cleveland 3.50-3.75
Chicago 3.87½-4.12½
St. Louis 3.50-3.75

Lead

New York 4.00-4.25
Cleveland 3.50-3.75
Chicago 3.75-4.00
St. Louis 3.50-3.75

Zinc

New York 2.50-2.62½
Cleveland 2.00-2.25
St. Louis 2.25-2.50

Aluminum

Borings, Cleveland 5.75-6.00
Mixed, cast, Cleveland 6.75-7.00
Clips, soft, Cleveland 13.75-14.00
Mixed cast, St. Louis 7.00-7.50

SECONDARY METALS

Brass ingot, 85-5-5-5, less carloads .. 11.00
Standard No. 12 aluminum ... 13.25-13.75

Metal Finishing

(*Continued from Page* 206)

in the architectural field, according to Milton Gallup, Enamel Products Co., Cleveland, who points out, "During this past year, a number of buildings have been constructed of major size which definitely place porcelain enamel in the main building field." A new school building recently constructed in Pennsylvania and utilizing porcelain enameled sheets for all exterior surfaces may mark introduction of a new type of building construction. The light walls make possible a marked reduction in amount of foundations and structural steel required as well as giving a flexibility important where ground surface movements may occur due to extensive mining or earthquakes.

F. A. Leisen, designer, Detroit, takes occasion to emphasize the many advantages that an outside industrial designer can offer manufacturers in determining best surface finish, shape, contour and material for a metal product. "Even where a company maintains its own design department, there are occasions when a competent design consultant with a fresh viewpoint can render invaluable service," Mr. Leisen asserts.

More Automatic Work

Dr. C. B. F. Young, electrometallurgist, Flushing, Long Island, N. Y., points out, "Since everyone is now conscious that to sell the surface is to sell the object and to protect the surface is to protect the object, much research is being directed toward improved finishes. A typical result, for instance, is seen in the field of cleaning where great strides have been made toward economical and fully automatic operation."

H. S. Willson, Paasche Airbrush Co., Chicago, also refers to advances in automatic processes. He says, "Undoubtedly the automatic aircoating, airpainting and airfinishing of all types of products has been an outstanding development during 1938. Already many well known organizations have standardized on automatic aircoating machines for all painting, finishing and coating operations and this will without doubt see great expansion during 1939, particularly where volume production is essential."

Electrolytic cleaning of strip steel has been stepped up to speeds as high as 1500 feet per minute, according to D. C. Miner, E. F. Houghton & Co., Philadelphia, who adds, "Better mechanical handling of strip through the bath and an improved method of conducting current to the strip has permitted this accelerated action. In step with better equipment are the new and more efficient cleaners, a prime factor in this speed-up. Much improvement is due to new balanced cleaners which do not depend upon high alkalinity for effectiveness," he points out.

Advances in electroplating have been numerous. A feature of the year's progress was extension of utility nickel plating, according to a review by R. C. Stanley, chairman and president, International Nickel Co. of Canada Ltd., Copper Cliff, Ont., who comments, "Due to their strength, resistance to abrasion and corrosion, heavy nickel plated coatings up to several thousandths of an inch thick are coming into wide use to protect both strong alloy and mild steel base structures.

"While built-up deposits have been common in England for some time, their use in the United States is comparatively recent. Hard, abrasion and corrosion-resistant nickel deposits are being used on dies, rolls and similar applications," says Mr. Stanley.

According to R. F. Yates, vice president, Krome-Alume Inc., Lockport, N. Y., nickel and chromium plating of aluminum is now being done on a low-cost commercial scale not only for decoration but also to produce antiwear surfaces

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and to permit solid soldering to the aluminum. He adds, "Unquestionably, the successful plating of aluminum represents the widest advance on the nonferrous front in years, opening up new uses and prospects of greatly increased tonnage. It is expected that its use on die-cast aluminum will permit such die castings to replace items for which plastics were formerly held most suitable. This development will soon be followed by successful plating of magnesium base, die casting alloys which will put them likewise in closer competition with plastics."

N. E. Promisel, International Silver Co., Meriden, Conn., mentions as a noteworthy development, studies in porosity which have resulted in producing on steel essentially nonporous deposits of nickel only 0.0001-inch thick and nonporous silver deposits 0.0002-inch thick. Also studies on pretreatment and striking have given improved adhesion of deposits, notably silver.

E. A. Anderson and H. A. Nelson, New Jersey Zinc Co., Palmerton, Pa., note two developments in the field of plating on zinc — high-speed copper and a method of depositing white brass. New finishes applicable to zinc include synthetics which need only a short bake at high temperature. Mention also is made of the interest expressed in the prefabricated building field in the unusual adherence obtained with alkyd resin, zinc dust paints baked on galvanized iron at a temperature between 350 and 450 degrees Fahr.

Metallurgists and "finishing" technicians have given much attention to the bright finishes but there appears little effort to develop dull or dark metallic finishes, points out George Switzer, industrial designer and consultant, New York. He says, "One is effective in contrast with the other. Real beauty will blossom in industrial design when we have a range of gun metal and other darker shades as a background for our bright accents. . . A development of some significance is nickel and chromium plating of magnesium, previously painted or enameled. Processes now available make it possible to produce a wide range of colors in this metal which then appears to have a dyed surface. While still experimental, they will undoubtedly be in commercial use soon."

C. W. Yerger, vice president, Hanson-Van Winkle-Munning Co., Matawan, N. J., emphasizes the progress in heavier electroplated finishes. He states, "There has been considerable progress resulting from the demand for heavier electroplated finishes to give higher rust and wear resistant qualities in metal finishing. . . Another field in which there has been intense interest and considerable development is in the electrolytic tin plating of steel strip and sheet."

Aluminum Coated Steel

Colin G. Fink, head, division of electrochemistry, Columbia university, New York, points to other significant developments in coating of steel, saying, "Outstanding improvements have been made in coating steel with zinc and aluminum. Also a ferromanganese coating on steel is produced by a new process wherein the steel is given an electrodeposit of manganese and is subsequently heat treated to bring about the alloying of the manganese with the iron base.

"In the nonferrous field," he continues, "improvements have been made in applying a hard, wear-resistant surface to aluminum. Of special interest is the Travers preliminary anodic treatment in oxalic acid. In another process, aluminum is anodized and simultaneously a film of shellac is electrodeposited... Also, on magnesium articles, chromate, permanganate, as well as fluoride baths have been applied successfully."

In the field of aluminum paints, the past year has been marked by advances in use of this material

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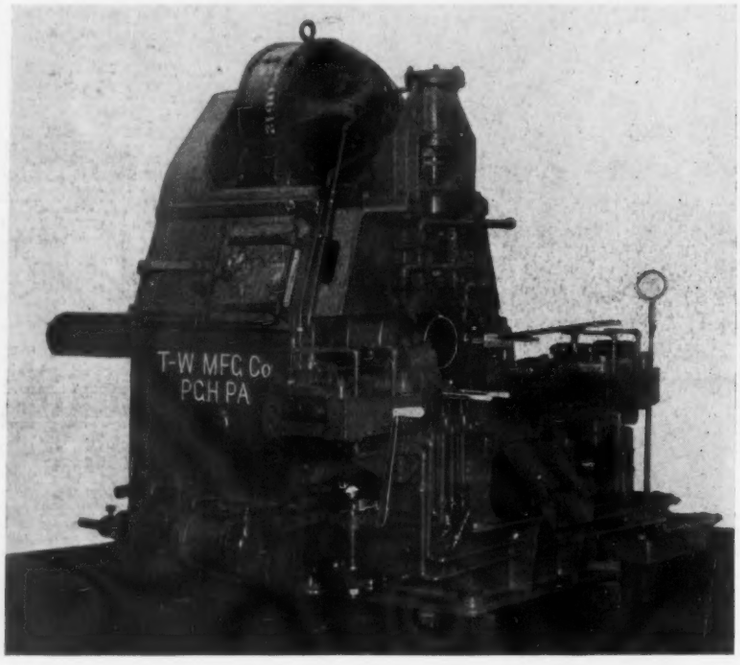
for Pipe Mills



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on steel highway bridges, due to its great protection value and high visibility, according to J. D. Stevens, Aluminum Co. of America. He says, "Today, approximately 75 per cent of all states specify use of aluminum paint either as a standard or an alternative finish for highway bridges. . . Use of aluminum powder in passenger automobile lacquers to effect iridescent finishes enjoyed a growing popularity in 1938. Several more states adopted aluminum-painted license plates during 1938 and others are scheduled to follow this precedent in 1939."

An outstanding feature of 1938 was the progress made in coatings for wear resistance. Speaking of this factor, W. H. Spencer, metallurgist, Sealed Power Corp., Muskegon, Mich., says, "Several methods of reducing wear during the break-in period and of shortening this period have been developed. The first appeared in 1937 and was followed by wide application on piston rings, pistons, tappets, camshafts, cylinder liners, gears and other parts during 1938.

Increase Wear Resistance

"These treatments include a manganese and iron phosphate process, a magnetic iron oxide method, a sulphide treatment, tin alloy plating and a phosphate treatment. All interpose a nonmetallic or nonferrous material between the two cast iron or steel surfaces. In the short time these treatments have been in use, they have spread over a wide field and give promise of becoming more and more important as higher duty engines are developed. Many new applications are expected," Mr. Spencer concludes.

"In the field of anticorrosion coatings, research has confirmed the paramount importance of using straight phenolic resin, preferably in combination with tung oil," states Dr. William Krumbhaar, Reichhold Chemicals Inc., Detroit. "Phenol-cured tung oil shows an enormous moisture resistance, a most important function of a metal protective paint," he adds.

Reviewing progress in 1938, W. H. Spowers Jr., consulting engineer, New York, says, "One of the most interesting developments in galvanizing and a thing which overshadows in importance any particular development in the process has been the tremendous interest shown in this art by South American and European countries. Establishment of large sheet and pipe galvanizing plants in Buenos Aires and Rio de Janeiro, together with a tremendous amount of correspondence with many firms in this section indicates peak activity there.

"Also," continues Mr. Spowers, "the publication of the book, *Hot Dip Galvanizing Practice*, has resulted in receipt of hundreds of letters from abroad, evidence of the great interest in American methods throughout the world. In this country, one of the most interesting developments is the continued and growing acceptance of the neutral flux technique and use of Flux No. 20, due in a large measure to the influence this material exerts on residuum losses and economy of operation.

"Experimental work is continuing with a view to elimination of residuum losses. I look forward to the day when dross will be absent, oxides prevented and equipment will be of permanent durability," concludes Mr. Spowers.

W. G. Imhoff, consultant in zinc coating, Vineland, N. J., and technical director of research, American Hot Dip Galvanizers Association Inc., points to the steady improvement in galvanizing furnace design, new equipment for handling the by-products more efficiently and better quality of coating now obtainable. He says, "The past year has seen a steady advance in cleaning materials, equipment and methods, especially in the galvanizing of malleable iron cast-

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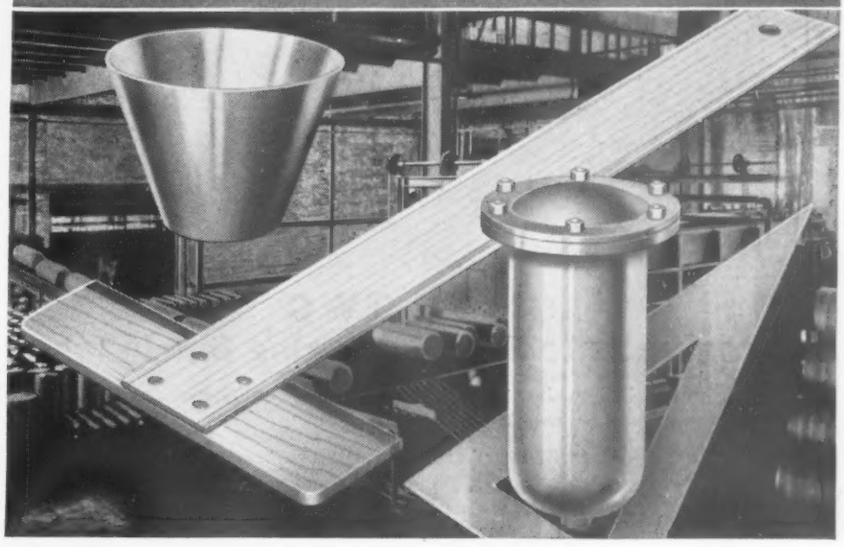

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ings and fittings. Improved inhibitors give faster pickling with increased efficiency and economy.

Pickling tanks, he continues, have been developed that will hold any kind of acid with little or no destruction. New mechanical equipment for carrying the work through the bath at high speeds has appeared. Improved pickling bath temperature control and improved methods of solution control also are available. Perhaps the most prominent feature in pickling practice during the past year is treatment of spent pickle liquors. Several processes now appear to offer solutions to this important problem. Fluxing practice has advanced, modern liquid fluxing showing greatly reduced dross production, few seconds and increased economy, production and quality.

"An outstanding development of the past year is what may be termed 'fast galvanizing', a new technique which greatly increases speed of zinc coating. As was to be expected, some trouble was experienced but this has not in any way stopped progress along these lines," Mr. Imhoff adds.

In 1938 American Hot Dip Galvanizers Association Inc., Pittsburgh, published "Painting, and Treatment of Galvanized Iron Before Painting." A second publication to appear this year was "Treatment, Disposal and Handling of Waste Pickle Liquors." The association reports receiving many requests for copies of the 17 standard specifications it now has available.

F. G. White, Granite City Steel Co., Granite City, Ill., and chairman, Galvanizers' committee, American Zinc institute, in summarizing the year's activities reports items of special interest that have come under discussion at meetings this year. These include: Wheelabrating sheets to improve coating adherence, controlled spangles on galvanized sheets, high-speed machines, trend towards galvanizing cold-reduced stock in the lighter gages, larger kettles, smoother drives to give better uniformity of coating, introduction of a tightly adherent heavy coating and increasing use of tin in galvanizing baths.

Heat Treating

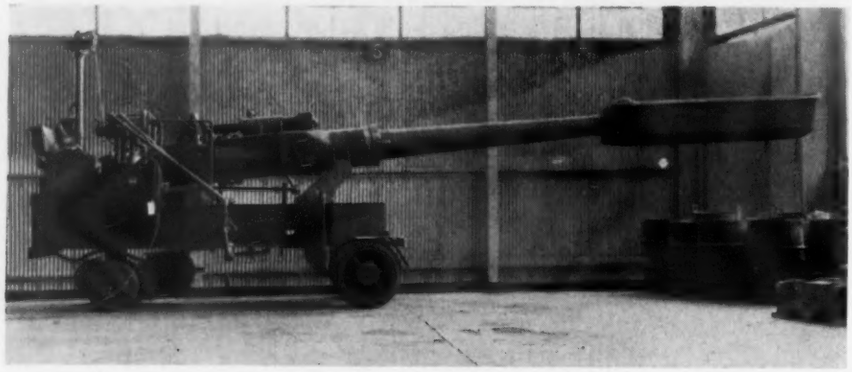
(*Continued from Page* 172)

justifies the cost of protective heating, in the opinion of H. L. Hopkins, metallurgist, National Screw & Mfg. Co., Cleveland. More thorough study of fundamentals of protective gases has afforded an academic background for production installations, thus, he says, the past year has witnessed a remarkable increase in application of both gas and electrically fired, controlled atmosphere furnaces for a multitude of jobs.

Electric furnaces have been used extensively, Mr. Hopkins continues, because of the mechanical ease by which they can be converted to accommodate controlled atmosphere; gas-fired units have been studied from the practical point of view. Marked improvement in radiant tube design has extended production performance of the tubes.

There is room for extended experimentation on effect of different gas combinations on chemical analysis of the material, he points out. Particularly is this necessary to overcome decarburization in steels covering widely different carbon ranges. Improvement and simplification in generator equipment is extremely desirable in producing the necessary gas for a given job.

Controlled atmosphere furnaces are now about as common in up-to-date heat treating plants as ordinary furnaces were years ago, observes R. L. Dowdell, professor of metallography, University of Minnesota, Minneapolis. Industry now has available for its use many new low-cost alloy steels developed as a result of extensive research. These include steels with controlled grain size and specific hardenability. The



SIXTY-TWO
Brosius Auto Floor Charging Machines

have been supplied to the steel industry in the United States and abroad, ten of them since January 1, 1938.

Brosius Auto Floor Chargers are built to serve heating furnaces, open hearth furnaces, mills, hammers, presses, etc., and are particularly adapted to operation in restricted areas, as they can be turned on their own wheel base. They are built in capacities of from 2,000 to 10,000 pounds, are self contained, require no tracks or runways, and are comparatively inexpensive. No provision, aside from a good floor, is necessary for their installation.

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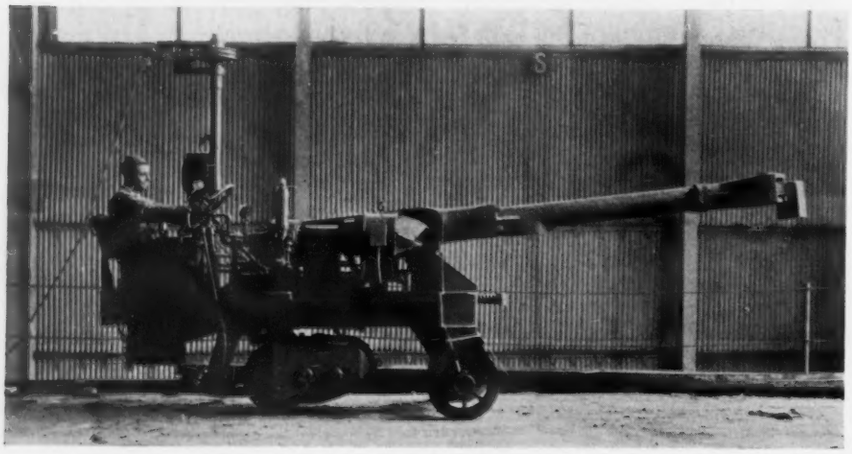
European Distributor: Dango & Dienenthal, Siegen, Westphalia, Germany
Brosius Equipment is covered by patents allowed and pending in the United States and Foreign Countries



leaded screw stocks have just established themselves and it appears probable that lead addition will be made to make special alloy steels without serious impairment of mechanical properties.

Use of the oxyacetylene flame for surface hardening continues to command wide-spread attention, asserts H. L. Rogers, manager, applied engineering department, Air Reduction Sales Co., New York. Although more than ever important as applied to gear teeth, it is no longer confined principally to that field, but is finding application to lathe beds, camshafts, crankshafts, small parts of light machinery, automobile hubs, and surfaces of heavy machine members too massive for heat treatment by other methods. "Possibilities for further extension," he contends, "are limited only by the ingenuity of manufacturers in devising automatic motion and control equipment."

Great activity in connection with flame hardening is anticipated by S. K. Oliver, heat treat department, Electro-Motive Corp., La Grange, Ill. The process has possibilities for production hardening of large driving gears, axles, wheels and crankshafts, and other large products requiring localized hard areas, ductile cores and freedom from distortion.

Flame Hardening Fills Need

Interest shown during the past year in selective hardening of heat treating grades of steel or cast iron has impressed A. E. Focke, research metallurgist, Diamond Chain & Mfg. Co., Indianapolis. Unquestionably, he says, flame hardening meets a definite need on those parts which could not be hardened without prohibitively large equipment or without excessive distortion. When the number of identical pieces is sufficient to permit setting up an exact schedule, metallurgically acceptable parts can be produced uniformly and economically.

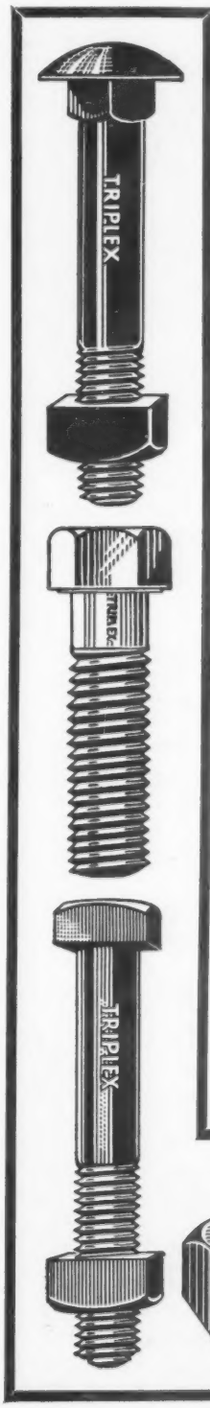
However, he asserts, where only a few parts are to be made, it is a serious problem to determine whether flame hardening should be attempted, particularly if the section to be hardened is of such shape that special torch heads are required. Also, the process appears so simple that there is grave danger it will be applied incorrectly by inexperienced operators on materials which should not be so treated. In direct competition with flame hardening, surface hardening of these materials by high frequency induction is receiving serious consideration.

W. P. Woodside, vice president, Climax Molybdenum Co., Detroit, and president, American Society for Metals, confines his observations to progress of salt bath heat treatment of high speed steels. During the past year, much work has been done in connection with the Ajax-Hultgren furnace toward producing better and more reliable salts and improving life of containers, whether they be cast metal, pressed metal or ceramic material. Liquid carburizing baths heated by these furnaces, once measured in pounds per month, now amount to tons per month, he believes.

W. H. Graves, chief metallurgist, Packard Motor Car Co., Detroit, comments that the outstanding metallurgical development in his plant the past year has been adoption of induction hardened pearlitic malleable camshafts. This change, he asserts, has given a shaft of much higher quality than a heat treated cast iron shaft, and one that is equal or better in quality and lower in cost than either a carburized or heat treated camshaft.

G. C. Riegel, chief metallurgist, Caterpillar Tractor Co., Peoria, Ill., regards as a most significant metallurgical contribution the development of the leaded steels which possess remarkable machinability and show no apparent detrimental factors in mechanical or physical characteristics when heat treated.

Touching upon an important prob-



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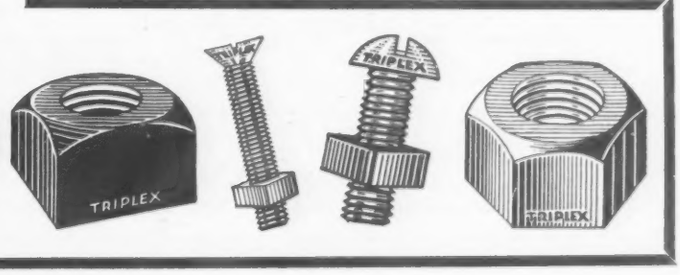

lem of the future, it seems to him that powder metallurgy holds promise for production of bearings having greater load carrying capacity at higher temperatures and pressures. An achievement greatly sought for by internal combustion engineers is a bearing with a layer of silver, graphite and lead blended off progressively to a pure metal at the surface with which it must be bonded with bronze or steel back. Mr. Riegel says work done by the bureau of standards along this line should offer some guidance to future experimentation.

Increasing applications of low alloy, high-yield strength steels, with appearance of two new members in the field during the past year, serve to demonstrate the sound technical and economic basis for development in the structural steel industry, states H. S. Rawdon, chief, division of metallurgy, national bureau of standards, Washington. However, of more immediate interest in the widespread endeavor to improve common steels is the introduction of the free machining steels.

For years, Mr. Rawdon continues, it has been tacitly assumed by many steel metallurgists that the "Ultima Thule" had been reached in this particular field. The successful attempt to incorporate a lubricant in the steel, in the form of lead, in addition to the other constituents which promote free-machining characteristics has been as revolutionary as unexpected.

Pointing out that certain elements present in iron and steel to the extent of a few thousandths per cent can cause changes in physical properties, W. B. Coleman, president, W. B. Coleman & Co., Philadelphia, reports he is finding increasing attention being paid to these minute amounts of impurities. Some of these elements, out of the reach of chemical analysis but now handled spectroscopically, conceivably affect physical characteristics and may enter into grain size. Grain size is commanding increasing attention and is frequently a part in routine inspection.

Mr. Coleman makes the point that because of the infinite number of alloy combinations possible, there are today available so many compositions of irons and steels that it is impossible for anyone to remember the various physical characteristics and properties. Time, he believes, will eliminate many of the special compositions, boiling the total down to well standardized types of alloys.

Although sulphur and phosphorus have been added to steel for a number of years to improve machining, successful addition of lead for this purpose opens up a new avenue for experimentation with this type of metal as addition reagents, he asserts.

Many alloys are made to provide corrosion resistance. It is the opinion of Mr. Coleman, however, that considerable money can be saved by using plain carbon steel which has been given a corrosion-resisting surface either by giving it a coating of special alloys or treating it with powdered metal which when absorbed into the surface provides the necessary protection.

Treatment by Air Heaters

Discussing heat treatment of copper alloys, H. P. Croft, chief metallurgist, Chase Brass & Copper Co. Inc., Cleveland, states that gas-fired air heaters of the convection type are admirably suited for certain operations in which the temperatures are well below those for the bulk of heat treating. Included in the low temperature operations are anneals for relief of excessive internal stresses, precipitation or age hardening heat treatments and true anneals for developing fine grain size.

The air heaters function by passing over the work at high velocities gases heated to the proper temperatures. Radiation plays an almost negligible part, heat of the gases being transferred to the work by direct contact. As a result, maximum

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efficiency is maintained by creating a turbulent flow. These furnaces, Mr. Croft explains, usually are of the continuous type but they may be operated on a batch basis by halting the conveyor hearth.

For stress relief annealing and true low-temperature anneals resulting in grain sizes up to about 0.020 millimeters on yellow brasses, furnace temperatures range from 400 to 950 degrees Fahr. and work is exposed from 20 to 45 minutes. Precipitation hardening requires periods from 2 to 12 hours, Mr. Croft says. Cost of annealing with gas-fired air heaters compares favorably with that of other types of furnaces for annealing copper alloys, he states, and uniform results from them are obtained.

Machining

(*Continued from Page* 202)

by older machining methods has led to widespread adoption of the new system by industry. Three important tool manufacturers have been licensed to build Superfinishing machines and during 1939 the public in general is destined to get the benefit of this finish in the manufactured products which they buy.

"A surface properly finished by this method has capacity for bearing loads of two or three times those of conventional fine finishes. Also, where proper lubrication is maintained, wear is practically eliminated and where there is no lubrication—as in brakes—the life of contacting surfaces is greatly increased. Capacity for absorbing and dissipating heat also is increased.

The following comments from the machine-tool-user point of view come from W. F. Wagner, master mechanic, Lincoln Motor Co., Detroit, and national president, American Society of Tool Engineers. Mr. Wagner says: "I have noticed during 1938 some decidedly progressive steps in surface broaching. Machines have been set up with multiple broaches arranged as units. Thus operations which formerly required the use of several milling machines are now being completed in a single broaching machine.

"Multiple turning of parts such as crank shafts and axle shafts has benefited greatly through use of tungsten carbide cutting tools. Today we are rough and finish turning all the crank pins and all the main bearings on crankshafts in multiple spindle machines. In the past these operations called for a battery.

"During the past year there have been noticeable advancements in precision boring and turning technique. Resulting finishes on bearings rapidly are approaching 'base metal structure' — a condition claimed by metallurgists to be the closest possible approach to the perfect bearing surface.

William Hartman, vice president, engineering and production, National Cash Register Co., Dayton, O., interprets the past year's machining progress in terms of what it has meant to his own company. He mentions, for instance, that the use of the nitriding process in toolmaking, not only increases the life of tools, but also bids fair to bring changes in toolmaking procedure.

Speaking of machineability, Mr. Hartman says: "That of cold drawn steel has been greatly improved, thereby allowing increased speeds and feeds, at the same time resulting in much better surfaces on cuts. This latter characteristic makes it possible to attain satisfactory surface finish with a forming tool."

He does suggest, however, that there still is considerable room for improvement in the machineability of some of the high carbon, high chromium steels so popular with toolmakers—assuming that this can be done without loss of heat treating advantages and wearability. Such improvements should apply to machining annealed parts and finish grinding after treatment.

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punchings in a hydraulic press, is another important development cited by Mr. Hartman. This involves use of a strippled punch and die, by which small, regular impressions to the depth of a few thousandths of an inch, are made in both surfaces of the stampings.

Of cutting tools, F. A. Shuler, master mechanic, Highland Park plant, Chrysler Corp., Detroit, says: "Much work has been done toward obtaining a material which will withstand temperatures higher than will high speed steel, and yet will possess the desirable characteristics of high speed steel. I foresee that developments along such lines may result in increased cutting speeds which will in turn demand further redesign of certain important machine tools."

The value of cemented carbide tools on the machining of ordinary cast irons, brass, bronze, aluminum and various non-metallic substances is now generally taken for granted, according to K. R. Beardslee, general sales manager, Carboloy Co., Detroit. "Therefore," says Mr. Beardslee, "let us consider other important phases of progress.

"The attitude toward their use in machining steel, and some of the newer cast irons whose cutting characteristics resemble steel, has changed. While choice of grades of cemented carbide is important, and new ones developed during the past year have resulted in improved performance, industry is coming to realize that the problem of steel cutting is not primarily one of grades. It is, rather, one of proper tool design and application, of chip control and disposal, and of power and rigidity of machines.

"A big step toward solution of the problem has been made by machine tool builders who have designed their latest machines with the power and rigidity required by the tungsten carbides. They also have made provision for the disposal of the chips—of which it must be borne in mind that from three to five times as many (by weight) are piled up in a given time, as compared to older machining methods."

"Wear tests," says G. B. Karelitz, professor of mechanical engineering, Columbia university, New York, "constitute in my belief one of the most difficult problems faced by the metal industries at the present time. Certain steels are wear resisting, others are not. Careful observation in the field over a period of time and in various applications gives engineers a fair idea of the wear resisting quality of a steel. But all attempts to devise laboratory means whereby this quality could be predicted for a new steel have, to date, met with signal failure.

Need To Study Friction

"I venture the opinion that the near future will bring important developments in the understanding of the phenomenon of wear and that the advance will be caused by physicists rather than engineers. It is useless to build more and different wear testers before the surface phenomena of friction are understood. Some light begins to appear. The British work of Bowden on surface temperatures of metals rubbing against each other, and of Tomlinson on the molecular theory of friction, will no doubt stimulate researchers in this country to follow similar lines of work.

"When it will become possible, and this is now nearer than it has been heretofore, to talk about the *kind* of wear instead of the *amount* of wear, the testing of wear will come out of the jungle in which it is lost at present."

August H. Tuechter, president, Cincinnati Bickford Tool Co., speaks with unusual authority, not only because of his important and active connection with the machine tool industry but also by reason of the fact that underlying his opinions is the experience of more than 50 years in this industry of which

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"It seems to me," says Mr. Tuechter, "that machine tool users have, during the past year, been showing an increasing desire to obtain machine tools fitted closely to the jobs for which they are to do. That, I believe, accounts for many of the new designs which have been brought out and for the increased variety of so-called standard machine tools. For instance, in our own case this state of affairs has resulted in recent additions to our line, not only of a radial drill much smaller than any available from us in the past, but also of some unusually large machines of this type.

"As far as the economic condition of the machine tool industry is concerned, I can say with feeling that the past year has been a hard one. That is an unnatural condition. It is due to the fact that much which is destructive to our industry, and little constructive, has come out of Washington.

Future Somewhat Brighter

"We should perhaps—on the basis of recent elections—have brighter hopes for 1939. For these hopes solidly to materialize, however, I believe that there must be early modification of the Walsh-Healey act, of the Wage and Hour bill and of the Revenue act. Frankly, I have no great enthusiasm for the much-talked-of Army and Navy programs as revival measures for our industry or the capital goods industries as a whole, and also their effect on these industries in any event is bound to be slow. Furthermore, unless the irksome and often senseless rules and regulations and laws now involved in getting government business, are revoked or at least made more bearable, many machine tool builders certainly will continue their well justified refusal to bid for government orders of any kind."

Looking back over 1938, C. J. Stilwell, vice president, Warner & Swasey Co., Cleveland, sees "satisfactory achievements" in machine tool design. "This may not be so apparent to the casual observer," he says, "because — while there have been some radical changes—general improvement has been due to many refinements in details.

"As far as hydraulic systems are concerned, their applications both to actuation and control seem to have been carried to a point where machine tool builders now have definite convictions as to their possibilities as well as their limitations.

"There still are wide opportunities for application and improvement of electrical control. Much of the standard apparatus is too bulky and inconvenient and it does not tie in with the trend toward streamline appearance. Co-operation between electrical manufacturers and machine tool designers must continue. For example, with flange-mounted motors gaining wide acceptance, should not their characteristics be modified in line with machine tool speed and feed practice?"

Continuing, Mr. Stilwell states, "Much of our engineering effort recently has been concentrated upon development of new accessories, attachments and tools, which make our machines perform with maximum accuracy and efficiency, without demanding more than minimum physical and mental effort."

Casting

(*Continued from Page* 211)

properties desired and methods of manufacture leading to a reduction in the number of such materials on the market. Committee A-7 of the American Society for Testing Materials has had the matter of specifications for pearlitic malleable under advisement for some time and expects to clarify this situation in the form of specifications as rapidly as the crystallization of opinion may make possible."

F. O. Parker, sales manager,

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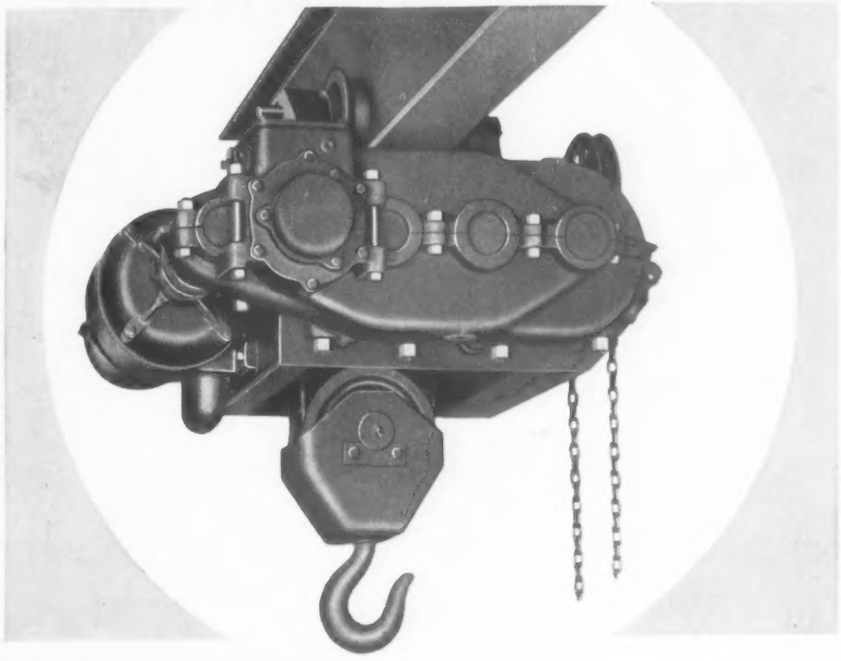

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Acme Steel & Malleable Iron Works, Buffalo, N. Y., and president, Malleable Founders' society, mentions the fact that new equipment in the foundry, cleaning department and annealing department, as well as improved production methods, have enabled the malleable iron producer to cut down importantly on the length of time necessary to make shipments of the product. The industry, he believes, is looking forward to the future with much confidence, and plans are under way to acquaint users in better fashion with the physical, shock-resisting and corrosion-resisting properties of malleable iron, as well as its machinability properties.

Current labor conditions, plus the substantial savings possible in production costs, have combined to make continuous pouring in the malleable foundry an attractive proposition, in the opinion of Enrique Touceda, consulting engineer, Malleable Founders' society, Albany, N. Y.

"In consequence," he says, "the number of plants which are adopting the duplexing system, in which the metal mixture is melted in a cupola and the molten metal run continuously into an air furnace, and in several cases into a direct-arc electric furnace, is increasing. Where circumstances permit, both continuous pouring and continuous molding have very definite advantages.

"Within the past year the technique of the duplex process has been improved in respect to control of carbon, while through the selection of a low sulphur, slow burning coke, the sulphur now can be kept within allowable limits. Since it is possible to make both carbon and sulphur determinations, each within a period of some three minutes by means of recently perfected chemical apparatus, cupola and air furnace compositions can be noted at short intervals, and thus rapid corrections in metal composition can be made when necessary. The claim, however, that a closer control of composition is possible in the duplex process as compared with ordinary methods of melting appears to have no foundation in fact.

Annealing Cycles Shorter

"With better understanding of factors which favor first and second stage graphitization, and stimulated by the demand for more prompt deliveries, annealing cycles have been shortened irrespective of the type of annealing equipment used. Through the use of the continuous annealing furnace coupled with a controlled atmosphere, the amount of surface decarburization can be regulated and freedom from scale assured. However, no improvement in tensile properties results from these innovations, for in any heat treating operation there are certain temperatures and definite times at these temperatures which produce the best results, and provided these conditions are fulfilled the manner in which the castings are heated or the equipment used makes little difference in tensile properties."

Turning the microscope for the moment on the gray iron industry, the comments of C. R. Culling, vice president, Carondelet Foundry Co., St. Louis, and president, Gray Iron Founders' Society Inc., are pertinent. He wonders whether the industry has made the most of its opportunities, whether it has been too modest about its achievements, whether it has made known the new and useful facts about gray iron castings; and he is inclined to answer in the negative.

But the society currently is sponsoring a step toward correcting these deficiencies. Battelle Memorial institute, Columbus, O., is searching existing literature of all languages on engineering properties and performance of cast iron and is tabulating data with A. S. T. M. specification A 48-36 as a control. The results will be surveyed by a committee of the society and recommendations made. Upon its comple-

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tion, this work will place in the hands of foundrymen authoritative engineering data about their product, data which will also be of inestimable value to the user of cast iron.

Emphasis will be placed on those properties exclusive of chemical composition, and the dangers involved in assuming given chemical compositions will produce given physical specifications will be pointed out clearly.

Keener understanding by both buyer and producer of gray iron castings already is being reflected in the fact a good jobbing foundry no longer produces just one routine gray iron for all products. A. C. Denison, president, Fulton Foundry & Machine Co., Cleveland, lists six classifications of material under which a jobbing foundry might classify its output. They are:

1. *Plain gray iron* for ordinary routine applications where form is more important than specific properties, and price is a major consideration.

2. *High strength gray iron* made for general engineering applications where definite specifications must be met, including, in addition to high strength, good resilience, impact and fatigue properties.

3. *Castings for best heat treating properties* where the entire casting is to be hardened by quenching and drawing or where flame hardening is to be practiced and definite results are desired in good hardness ranges.

4. *Wear resistant castings*, in hardness ranges from 260 to 450 brinell.

5. *Heat resistant castings* produced for best service performance in certain heat ranges.

6. *Corrosion resistant castings* for use where conditions warrant something better than conventional gray iron.

Need More Co-operation

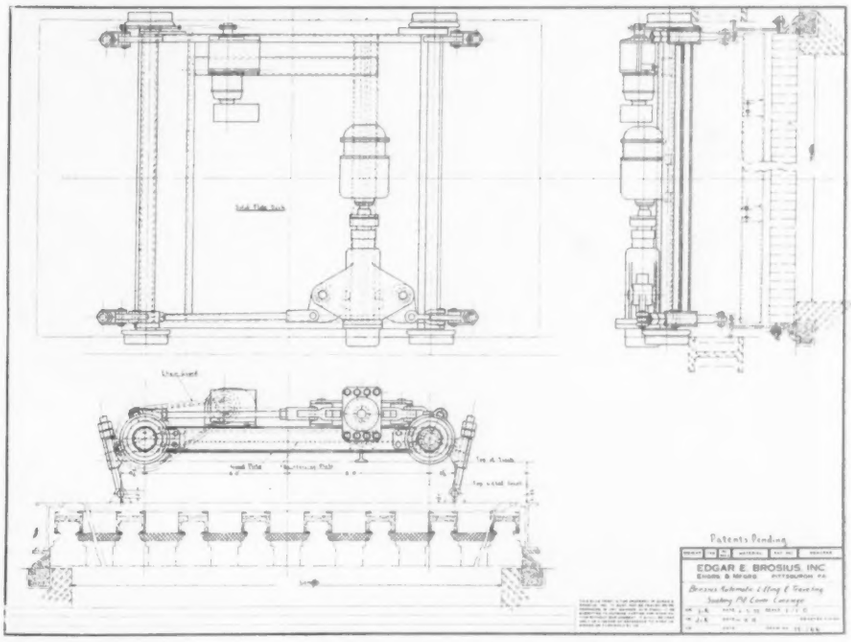
Improved production facilities and progress in perfecting better means of cleaning and handling of gray iron castings are evident in any retrospect of 1938, according to W. L. Seelbach, secretary and treasurer, Forest City Foundries Co., Cleveland, but he adds regretfully that there has been little progress in the organization of foundry executives along co-operating lines of business management. Management and sales problems, he feels, still call for serious attention by foundrymen.

H. W. Johnson, engineer, Greenlee Foundry Co., Chicago, observes, "The use of alloys and processed iron has aided considerably in the development of castings requiring high strength, uniform dense structures and heat-resisting properties. Coupled with the fact that gray iron foundries are experiencing closer control both in cupola practice and chemical analyses, wider applications for castings can be expected," Mr. Johnson asserts.

On the subject of alloys, W. J. Priestley, vice president, Electro Metallurgical Co., New York, points out that "in the iron foundry chromium has been given added recognition as an element of major importance in the production of high-strength irons. It is added to these irons either in the cupola by means of briqueted alloy or in smaller amounts to the ladle in special forms of ferrochrome. Cast irons with chromium contents up to 1.25 per cent are becoming standard for stove and furnace parts.

"For softer, more machinable cast irons, where strength is not of primary importance, foundrymen are using ladle graphitizers. The combination of strength and machinability obtainable from late additions of concentrated ferroalloys of high silicon content, in briquet form for cupola additions and in crushed form for ladle additions, has widened the use of these alloys," Mr. Priestley continues.

"There has been widespread interest in the use of calcium-silicon for steel castings as a means of improving ductility. This is particu-



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larly true when the calcium-silicon addition precedes the addition of aluminum.

"Other developments worthy of note have been the improved technique devised for production of stainless steel castings, especially the 14 per cent chromium type, and use of nitrogen for grain-size control in higher chromium castings. There also has been increased application of steel castings containing 3 per cent chromium and 0.5 per cent molybdenum which combine excellent physical properties and low production cost."

In his comprehensive review of the nickel industry in 1938, Robert C. Stanley, chairman and president, International Nickel Co. of Canada Ltd., Copper Cliff, Ont., alludes to a number of developments pertaining to the field of cast materials. One is the use of low cost nickel-manganese cast steels in light-weight side frames, bolsters and couplers of freight cars. Another is the extended use of nickel-chromium-molybdenum steels for dredge pump castings.

Reporting for iron foundries on the West Coast, Charles Hoehn, president, Enterprise Foundry Corp., San Francisco, observes that plants in his district made real progress during the past year in improving quality of cast materials, and are losing no opportunities to provide a product to meet the competition of suppliers in other districts.

Current search for quality methods has never been more intensive in the history of the foundry industry, believes R. G. McElwee, foundry engineer, Vanadium Corp. of America, Detroit. He adds that "improvements in melting processes and closer control of existing methods are contributing to extend the use of cast ferrous materials into new fields." He sees an urgent need for more highly trained men to occupy key positions in the industry.

Noteworthy developments of the past year are summed up tersely by R. S. MacPherran, chief chemist, Allis-Chalmers Mfg. Co., Milwaukee, as follows: "Further development of the use of molds made from Portland cement and sand; flame hardening of cast iron; continued growth of alloy iron."

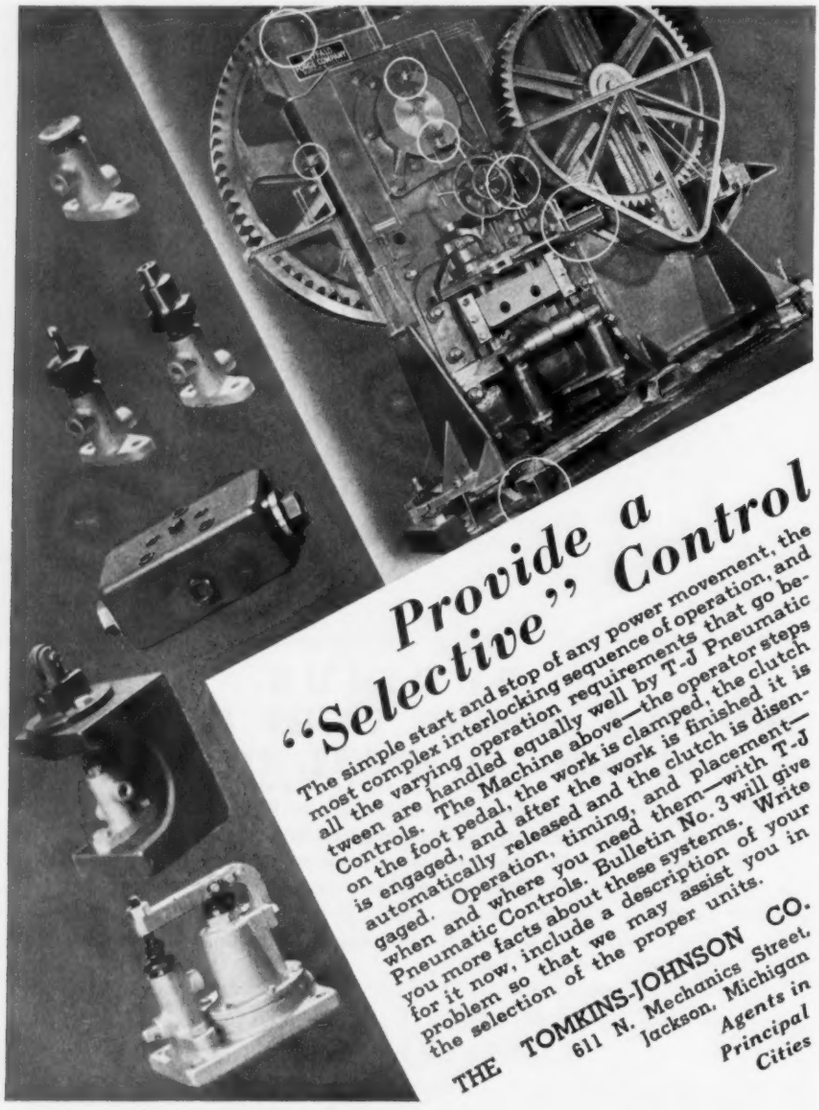
J. W. Bolton, metallurgist, Lunkenheimer Co., Cincinnati, urges foundrymen to keep in close touch with studies now being made on the effects of temperature on the properties of metals. Castings and other metals used to handle high-temperature high-pressure fluids must not only be sound and uniform and possess good properties at ordinary temperatures, but also must have good resistance to creep or flow at elevated temperatures, as well as retaining toughness and stability under long periods of exposure. Of further importance currently is the amenability of castings to welding without the formation of zones of low ductility and high hardness.

New Bronzes Produced

"Development in the nonferrous casting industry," reports N. K. B. Patch, secretary, Lumen Bearing Co., Buffalo, "has been one of slow, gradual change, without outstanding incidents. Advent of bronzes with an appreciable nickel content has made available bronzes which meet requirements heretofore not believed possible. Development of aluminum bronze and the increasing understanding of how to produce sound and satisfactory castings from this alloy during recent years have been significant."

Mr. Patch points out that new characteristics in rolled and drawn nonferrous alloys have invariably been reflected in new demands upon nonferrous castings, calling for matching of color, corrosion resistance, or other qualities. Demand for better plated finishes has inferred a need for castings which will take high polishes with minimum production cost, in turn implying research toward perfecting new alloys. Heat treatment of castings is maturing rapidly into a more exact science.

Examining briefly the outlook and past year's progress in foundry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equipment reveals a concerted program among many foundries to make their plants more healthful and pleasant places in which to work. Federal and state regulation of conditions has given added impetus to the elimination of harmful agents such as smoke, dust, vapor, grit and the like in foundry atmospheres.

H. S. Hersey, vice president and general manager, C. O. Bartlett & Snow Co., Cleveland, and president, Foundry Equipment Manufacturers' association, points out that shakeout operations noticeably have been a producer of obnoxious conditions for workmen and much work has been done and is continuing toward correcting this deficiency.

Handling Equipment Cuts Costs

A considerable improvement in material handling equipment in the interests of cutting costs is another trend commented upon by Mr. Hersey. These improvements have been in the direction of providing higher grade materials and improved bearings in this type of equipment, minimizing breakdowns and replacements.

Conditioning of sand is receiving more attention likewise, observes Mr. Hersey, and the drying and cooling of sand for cores is coming to be a definite requirement in numerous foundries, especially where core blowing machines are employed. Incidentally, the inception of modern methods for coremaking and core handling is doing much toward reduction of core costs. Sand reclaiming systems which employ separate cleaning, washing, drying, and often calcining equipment are receiving more acceptance.

Mr. Hersey alludes to the use of special "chipping" conveyors in some production foundries as an example of the extra convenience being employed to condition castings after sand blasting or other cleaning operations.

Mechanization as an aid to better control and greater uniformity of operation is emphasized as an important trend of 1938 by R. E. Prussing, vice president, Whiting Corp., Harvey, Ill. This is not only true in large plants, but even in smaller shops where, for example, skip hoist chargers have been installed for small cupolas.

Desulphurizing of cupola metal in insulated U-ladles at the spout has permitted foundrymen to use a larger percentage of scrap in the cupola and reduce the cost of iron at the spout, frequently as much as $2 per ton, Mr. Prussing observes.

"The foundry trade in 1938 exhibited a marked trend toward incorporating testing equipment to enable the personnel to control purchase and processing of materials," states H. W. Dietert, president, Harry W. Dietert Co., Detroit. Continuing, he says, "Of particular note is the forward step made in controlling the physical properties of molding materials to more exact figures.

"Most foundries, both large and small, now have sand testing equipment to measure moisture content, permeability, green strength, dry strength and mold hardness of their sands.

"Savings secured by instituting sand control in a medium size foundry under the present production rate are averaging substantially $5000 per year, as a result of reduction in raw materials used, and improved sand condition which avoids delay in molding and reduction of scrapped castings.

"The past year has marked the introduction of synthetic sand, compounded from silica sand and bonding clay or bentonite, for light weight castings where a sand with 30-40 permeability is required.

"Testing of molding sand and cores at elevated temperatures by means of the dilatometer has been instituted at several foundry laboratories, yielding data on expansion, contraction, hot strength and rate of core breakdown at elevated or pouring temperatures."

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Materials Handling

(*Continued from Page* 180)

cut out of each long one as it goes through the line, two shear cuts being made simultaneously. In this instance also, the sheets are delivered at the end, cut to length, squared and roller leveled. Both lines operate at speeds from 100 to 300 feet per minute and are good examples of the use of conveyors in connection with continuous side-trimming and shear lines in steel mills."

N. W. Elmer, engineer, Stephens-Adamson Mfg. Co., Chicago, also points to the trend, the combining of processing with conveying equipment. "An outstanding development of 1938," he says, "is the adoption into the field of industrial processing of an established type of en masse conveyor. From a simple beginning where copper concentrates were elevated out of and separated from the liquid, or small coal was dewatered in a washery, the Redler conveyor elevator has suddenly advanced to where it forms an essential part of processing equipment.

"Now it chlorinates or dechlorinates material in transit. It also extracts solvents in varying industries and widely differing materials while at the same time conveying the solid residue and the enriched solvent to different delivery points. The distinct trend towards incorporating processing operations with conveying or handling operations is evidenced by this transition of a handling system to a 100 per cent piece of processing equipment."

Another important trend is noted by L. M. Sears, managing partner, Towmotor Co., Cleveland. He says, "Notable during the past year has been the tendency of industrial concerns to adopt the general type of system employed by those specialists in volume handling, the stevedore, carloading and warehousing companies. Essence of this method is 'live storage.' The fork lift truck equipped with conventional forks or other types of carrying devices, combined with pallets, skids, hoppers, or racks, is the basis of such a system as this.

Unit Loads Are Larger

"The fork truck not only conveys material but its chief use is in stacking and spotting these larger unit loads. Often the use of tractor and trailer trains enable large numbers of unit loads to be moved simultaneously, lift trucks aiding in loading and unloading. The increased interest in the 'live storage and standard shipping unit' idea promises much as a means of lowering material handling costs. Reduction in handling costs still offers the greatest possibilities for savings," Mr. Sears concludes.

Speaking of trends in use of trucks, F. J. Shepard Jr., treasurer, Lewis-Shepard Sales Corp., Watertown, Mass., says, "Materials handling problems in the metalworking industry are becoming more specialized. This is probably bcause most plants are now well equipped with standard type lift trucks, portable elevators and die lifters. To make further savings, it is necessary to seek new adaptations.

"A further need for new designs," according to Mr. Shepard, "is brought about by the rapidly increasing output of coiled steel strip. New types of transfer trucks for removing the coiled strip from winding mandrels have been brought out. Coiled strip is now being shipped on pallets similar to those used for tin plate but in larger sizes. This has necessitated the design of heavier-type pallet trucks, running up to 5000 pounds."

J. G. Bucuss, Acme Steel Co., Chicago, emphasizes the important improvements that have been made in the better packaging for shipment of steel bars, rods, tubes and structural shapes. "Easier handling at a lower cost as well as better protection of the product," states Mr. Bucuss, "is accomplished by reinforcing individual bundles with flat

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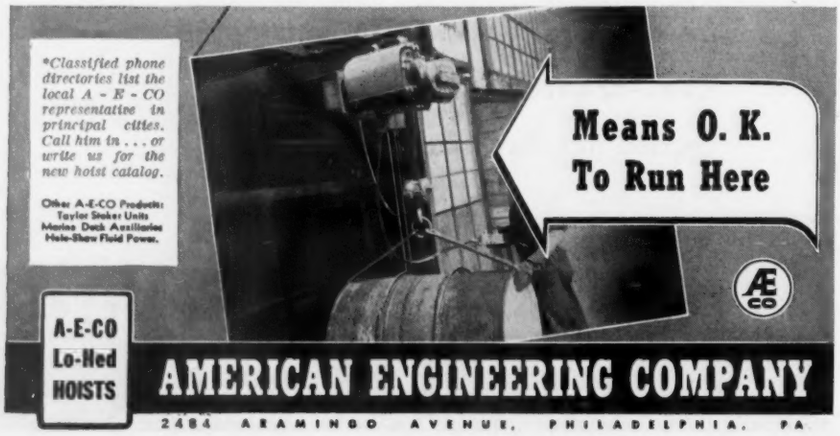
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steel bands, tensioned and sealed with specially designed tools. Where the material is to move in open cars, individual bundles for export shipments can be given additional protection by wrapping the bundle in waterproof paper held with steel bands. Individual bundles then can be assembled into one large bundle in the car and braced with bands to effect safe delivery with added economy in time and labor saved at the unloading end.

"Use of an inexpensive nonreturnable skid, and steel band reinforcements," Mr. Bucuss points out, "usually greatly reduces the cost of shipping semifinished and finished steel products at the shipper's plant as well as at the receiver's. Also it insures delivery of the product in first class condition." One of the outstanding installations of this method of packaging is at the plants of General Electric Co. where it is used not only for interplant shipments but in handling raw material and finished product. ("Interplant Shipping," STEEL, May 23 and May 30, 1938).

"A recent development in use of steel bands, which considerably reduces cost of bracing," adds Mr. Bucuss, "is application to twin or triple loads of structural shapes. This method also reduces the amount of time and labor involved at the receiver's plant in removing bracing."

In the field of continuous tread, crawler type, tractor units, there are a number of interesting applications which serve to indicate trends in design and use of this equipment. D. A. Milligan, Cleveland Tractor Co., Cleveland, points to the use of tractor-mounted welding generators. Being a self-propelled unit, such equipment is readily adaptable for use in bridge repairing and reinforcing work, structural erection, laying of rails and repairing battered rail ends. It eliminates long cables, thus increasing efficiency.

More Tractors Being Used

"There also is an increased tendency," continues Mr. Milligan, "to use crawler-type tractors in plants for transporting material where heavy loads on dollies or wheeled trucks are pushed or pulled about as required. Another rapidly expanding use is in cleaning up interior of ore boats where a bulldozer attachment on the front of the unit enables material to be collected rapidly at one point for removal. The tractor unit is slung from a crane or hoist and simply lowered into the hold." Mr. Milligan also notes some demand for light, low-priced, highly mobile units for handling material in plants where the quantity to be moved is not sufficient to justify purchase of a large capacity equip-

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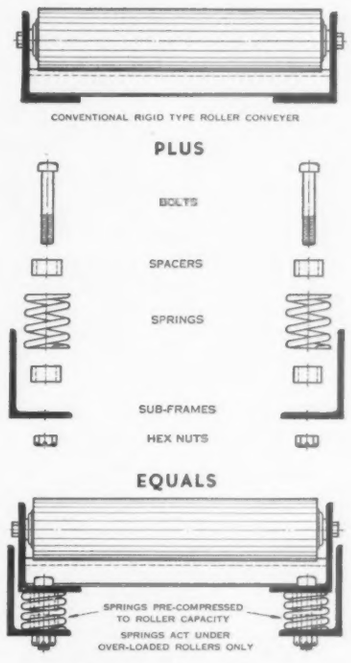

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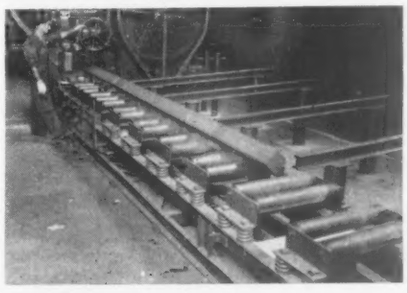

CAUSE AND EFFECT

THE principle is simple; the roller axles are rigidly locked in the frame as in the conventional "rigid type" construction, but the conveyer frame which retains the rollers is carried on pre-compressed coil springs, the springs held in compression equal to the rated safe load of each roller. Under impact conditions or excessive loads the springs absorb the overload.

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TYPE 53, Rollers 2⁹⁄₁₆", 3½" diameters, 600 lbs. capacity per roller.

TYPE 58, Rollers 3½" diameter, 2000 lbs. capacity per roller.

TYPE 63, Rollers 4¼" diameter, 4000 lbs. capacity per roller.

TYPE 110, Rollers 5" diameter, 8000 lbs. capacity per roller.

Ask for Data Sheet 24-A & B. It contains complete engineering data The book "Equipping Industry for Continuous Production" illustrates installations. Both items sent upon request.

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CONTINUOUS FLOW PRINCIPLE OF HANDLING MATERIALS

ment for permanent installation.

"An illustration of this is seen in a plant where a tractor is used with a trailer-type 36-foot boom. Tractor counterbalances the load, and a winch on the tractor hoists the load. This unit weighs 3200 pounds, is built of welded triangular sections and is capable of lifting 6000 pounds. Unit is transported on pneumatic tires.

"Lifts are made with the load transferred to jacks which support framework. Unit may be taken down easily and hauled through any city without violating traffic laws. A potential use for such a device is seen in the erection of steel houses and similar prefabricated structures," Mr. Milligan points out.

Develops Direct-Drive Switcher

P. W. Thomas, Fate-Root-Heath Co., Plymouth, O., regards production of the first, direct drive, heavy duty, diesel locomotive as a most significant development. He says, "With the rapidly increasing use of diesel locomotives for switching and other services, there has been a demand for the flexibly operated, direct drive diesel. "Low first cost, safety with full visibility for one man operation, and extremely low operating costs are the inherent features in the Plymouth Flexomotive units recently developed," Mr. Thomas says. "Fuel consumption is only three gallons per hour. Average maintenance costs, ascertained by 7000 hours' operation, are about 20 cents per hour. Two planetary drive units make available four speeds forward and reverse. Whole drive assembly is simple, and control is through air cylinders." This new locomotive powered with an engine manufactured by the Cooper-Bessemer Corp., Mt. Vernon, O., will be described in an early issue of STEEL.

Among a large number of outstanding materials handling installations the past year, space permits mention of only a few. A DeYoung, Whiting Corp., Harvey, Ill., directs attention to an installation of a number of 20-ton overhead traveling cranes which serve the scarfing and shipping department of a large steel producer. Cranes handle five or six large slabs at one time and pile them underneath a gantry crane runway where a number of gantry cranes spread out the slabs.

Mr. DeYoung also points to the development of a simple mechanical cupola charger of such low cost as to be obtainable by any foundry. It can easily be fitted into a limited space with little building alteration and takes the men entirely off the charging floor. In fact, the old charging floor, too low in 99 out of 100 cases, can be eliminated altogether, permitting the charging floor to be raised to whatever height is desirable for good melting practice.

Another installation of unusual interest is that placed in operation at the Spruce mine of the Oliver Iron Mining Co., Eveleth, Minn. Here nine individual belt conveyors form a system which provides a constant flow of 750 tons of iron ore from the deposit to a railroad shipping pocket, 4500 feet away. Total vertical lift is 386 feet, and conveyor moves at rate of 500 feet per minute. (For details, see STEEL, Feb. 7, 1938).

Of the elaborate materials handling system recently inaugurated in plants of aircraft manufacturers, possibly that of the Boeing Aircraft Co., Seattle, is an excellent illustration of the mechanization being employed.

In this plant, some 8500 feet of monorail are in use. A clear span crane of the underslung type is 162 feet long and can carry a 20-ton load distributed along its length or 5 tons at any one point.

Joining and Welding

(*Continued from Page* 186)

resulted in automatic feeding mechanisms being developed. Time and thought given to the electrical design of resistance welders has definitely reduced current required for any given welding operation. . . Development of the Ultra-Speed welder is an advance beyond the well-known hydrospeed type and permits an appreciable increase in production along with an improvement in quality.

"Complete electronic control equipment, recognized as the ultimate in accuracy, has been reduced in size and price thereby making it economical to use on jobs where the initial investment previously was prohibitive. Result is increased quality and precision in resistance welded fabrications. Vacuum tubes as electronic contactors have developed to a simple, effective form with a price commensurate with contactor control. Contactors themselves have been improved. A simple self-synchronizing unit now available will break heavy welding currents with substantial elimination of the arc.

"Interrupted welding, using a series of current pulsations rather than a steady current, has made possible the satisfactory spot and projection welding of heavier gages of material than heretofore possible. Further development of this system will undoubtedly bring resistance welding into many new fields.

"The Hart process of welding tubular fabrications has been developed to a point where it now permits high production work on steel tubing with strong joints having no external flash. Electric brazing with machines, although not strictly resistance welding, is being widely applied in fabricating copper and other nonferrous parts. These developments make 1938 outstanding as a year of progress," concluded Mr. Humphrey in looking back over the year's accomplishments.

Advances in fabrication practice are seen by T. W. Allen, manager, Fabricating division, Taylor-Winfield Corp., Detroit, to result from improved shears, forming and rolling equipment, flame shape cutters,

etc. He says, "Closer tolerances in welded fabrications are now possible. For instance, 400 small frames were constructed recently of 3/16-inch plate and standard bar sections. The height of mounting pads on these frames was held successfully to within 0.030-inch and some 0.015-inch. Use of jigs and prefabricating of subassemblies prior to final assembly are being employed widely to save time and costs."

J. H. Cooper, welding engineer, Taylor-Winfield Corp., Warren, O., notes the trend toward premachining of parts prior to welding in the assembly. He adds that many parts are being drilled and tapped prior to fabrication as these operations can be handled more efficiently on the smaller units.

J. A. Weiger, vice president, P. R. Mallory & Co. Inc., Indianapolis, in discussing developments in the field of electrodes for resistance welding says, "Many improvements were made during 1938, resulting in more uniform welds, increased production, and further development of high speed automatic machines. New, high strength, high conductivity, copper alloy electrodes were introduced. Life of electrodes was increased by improvements in design, shape, water cooling, methods of fabrication, better timers and more effective synchronization of pressure, current and time cycles. Future work of engineers collaborating with the Resistance Welding committee, organized in 1938 by American Welding society, will anticipate the demands of users of resistance welding."

Gas Cutting Is Expanding

H. L. Rogers, manager, applied engineering department, Air Reduction Sales Co., New York, comments upon the expansion of gas cutting. "The past year has seen a demand for gas cutting machines capable of operating over a greater area and with greater adaptability to special requirements such as the production of irregular bevels and the mounting of multiple torches." Gas cutting machines now cut plate and bevel for welding in one operation. Similarly, they can be combined with flame softening torches to reduce hardness at the cut edge. Such combination machines appear to afford considerable possibilities.

In the bolt and nut field, an important development is manufacturing nuts by cold forging. According to A. E. R. Peterka, technical assistant to the vice president, Lamson & Sessions Co., Cleveland, round wire is fed into a machine, cut off, upset in several stages, and in a sense extruded from the center out to form a hexagon blank with practically no scrap. This promises to be an important development as

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New Year, New Hopes

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♦

Two years later on January 5, 1884—after 12 had been trampled to death and scores injured at the opening of the Brooklyn Bridge — STEEL reviewed the previous depression year in this familiar tone: "Business dragged and sagged all through the 12 months, the unvarying tendency being toward restricted consumption of manufactured products . . . the general situation, although strained, was not suggestive of collapse or stagnation."

♦

Ten years more of growing frontiers — the great Chicago World's Fair—and then on Jan. 4, 1894, STEEL's editors wrote these words just six months before President Grover Cleveland was to call out the federal troops to quell the Pullman strike: "There will be no regret in the iron trade at parting company with 1893. . . . There is no comfort in the retrospect of such a year. As to the cause of its misfortunes there was no agreement among sufferers, or among legislative physicians. As the trouble gets farther in the distance, theorists who see the working of but one set of forces will even get to disputing as to facts and conditions that, at close range, are universally recognized. . . . There never was a parallel to the present situation."

♦

Years of expanding industry—the war boom shooting production to capacity, and with seven years of "normalcy" ahead STEEL's Yearbook issue of January 5, 1922 said: "Good cheer has not been prominent in the business situation in 1921. . . . What is needed most at present is a rejuvenation of rational confidence—a rebaptism of courage and faith. This is the spirit that has given America its commercial greatness."

♦

Came Coolidge Prosperity—Black October, 1929—Bread Lines—Banks Closed—*A New Deal!*

♦

Alphabetic Soup—Brain Trust—Economic Royalists!—Business Sags—Breathing Spell—Business Spurts—Relief Millions—Relief Billions—Still 10,000,000 Unemployed—Recession. . . .

♦

And so on January 2, 1939, at the first blush of a new year which offers hopes of better things to come, let's tame tomorrow's fears and as. . . .

Dusky shadows softly fall
Across the trail of 'thirty-eight
In plaintive tone there comes a call
"Look well ahead or share my fate
Year of 'Thirty-nine."

Muddling through will not avail.
Employers now must lead the way,
Though difficult may seem the trail,
At crucial times the sky seems gray,
Laboring in 'Thirty-nine.

Turn your thoughts to helping, now,
Renew your faith of men in God—
An oily hand—a sweaty brow.
Despise not him who turns the sod.
Encourage them in 'Thirty-nine!

—SHRDLU

such nuts can be made to extremely close dimensions and with an excellent finish. Also they have no planes of weakness and so match high tensile bolts. This development also opens up a field for nuts of brass, bronze, aluminum and perhaps stainless steel due to its economies.

Another important development, according to Mr. Peterka, is the surprising strength of products made in continuous bolt machines which take round wire in coils, cut off, upset, extrude or double extrude, trim, point, and thread the piece to turn out a completed bolt.

H. C. Erdman, chief engineer, National Screw & Mfg. Co., Cleveland, points to the great progress made during the past year in the use of lock washers assembled on screws. Some of the large automobile manufacturers have installed machines to assemble lockwashers with screws and to present them to the assembly line, according to Mr. Erdman. This saves 50 to 70 per cent of the operator's time, he adds.

In the field of riveting as used with light weight alloys on airplanes, buses, streamlined trains, etc., P. Van Sittert, designing engineer, Cleveland Pneumatic Tool Co., Cleveland, speaks of the added impetus this work has given to riveting. He says, "Duraluminum rivets are employed extensively with a growing use of the A17ST, or 'preheat-treated' material, which does not require refrigeration. Although pneumatic hammers in small sizes suited to this work will continue in favor, there is a growing trend toward use of compression or 'squeeze' riveters where possible."

Cold Riveting Emphasized

A growing trend toward use of cold driven rivets is observed by Pierre Champion, president, Champion Rivet Co., Cleveland, who states, "A large structural steel fabricator is making general use of the process, driving rivets cold in sizes up to 1⅜-inch diameter. These rivets are made dead soft and are machine driven. A peculiarity of the process is that driven heads must be flat to provide proper flow of metal and to reduce driving pressures. These rivets fill holes more completely than hot rivets and display higher physical properties as a result of the cold working of the metal."

Other observers agree that cold riveting is about to expand rapidly. A. F. Jensen, president, Hanna Engineering Works, Chicago, says, "Cold riveting appears to us the most promising possibility for the future of riveting. Many are already enjoying its benefits. Many more will when it is recognized that modifications in the size and shape

of driven heads result in equally efficient joints at substantial reductions in costs."

Otto J. Maha, chief engineer, Hannifin Mfg. Co., Chicago, points out advantages of cold riveting, "Not only does cold riveting eliminate costly methods of handling hot rivets but it enables a better joint to be produced. Moreover, a rivet headed cold can be relied upon without further costly inspection. With recent development and successful application of portable hydraulic riveters, interest in this fastening method is rapidly increasing," he adds.

Publication in 1938 of "Simplified Practice Recommendation 169-37, Machine, Carriage and Lag Bolts," is cited by W. C. Stewart, technical advisor, American Institute of Bolt, Nut & Rivet Manufacturers, Cleveland, as an important contribution to the art of bolting. He states, "Common usage of this recommendation will result in improved service to users of bolts by indicating sizes readily obtainable from stock. In the long range, it will result in economies through common use of a simplified number of bolt sizes.

Codes Permit Economies

"Future trends in use of bolting and riveting," he points out, "will be toward improved and more economical designs in the light of modern materials and methods. Recent investigations show that many conventional restrictions are unwarranted and that significant savings can be realized by full utilization of possibilities of bolting and riveting. The recently adopted New York Building Code, for example, permits bolts on many applications heretofore avoided. Also many recent construction specifications have approved higher design stresses for bolts and rivets, together with more economical design regulations."

In the field of special fastenings, G. A. Tinnerman, president, Speed Nut division, Tinnerman Stove & Range Co., Cleveland, directs attention to new Speed nuts especially suited for blind fastening applications where they produce a number of important savings by eliminating a multiplicity of parts, reducing work required to prepare the assemblies, as well as sealing the enclosed space against entrance of water, dirt, etc. Another important development is the U-shaped type which is self-locating and self-supporting. With some 600 different types now developed, these fasteners have contributed greatly to widespread use of steel in industry by making practical the assembly of "streamlined" steel products, Mr. Tinnerman adds.

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od is described by H. W. Kost, general manager, Presthole Devices division, Detroit Harvester Co., Detroit, who says, "The possibility of securing desired fastenings by forming a nut out of the metal to be joined is, I believe, the most important development in sheet metal fastening during the past year. In the future, more emphasis will be placed on using the inherent strength of a sheet of properly formed metal for fastening," he predicts.

Wire stitching, another special fastening method, has experienced wide increase in range of applications handled, according to S. L. Smith, Bostitch Inc., East Greenwich, R. I.

Mr. Smith also states, "The method now is applicable not only to fastening two sheets of metal together but is suitable for fastening other materials such as fabric, wood, etc., to the metal. Dead soft material up to ¼-inch thick is being stitched successfully, the thickness practically decreasing with increasing hardness. Speeds as high as 200 stitches per minute are being obtained," he adds. Many automobile builders have adopted this method.

Progress in Steelmaking

(*Continued from Page* 199)

Reduction Sales Co., New York, scarfing recently has come forward as an economical procedure for exposing surface defects in semifinished steel products and as a satisfactory surface preparation prior to painting structural steel. The wide variety in character of scale formed on steels of diverse compositions and mill treatment has led to considerable experimental work which points to wider use of the process.

Use of small additions of lead to steel to improve machinability is an outstanding development of the year. Tests conducted by Battelle Memorial institute, Columbus, O., show that fractional percentages of lead, preferably from 0.2 to 0.3 per cent, have increased output of automatic screw machines in test runs as much as 72 per cent. This is brought about by a combination of higher permissible cutting speeds and longer tool life.

Contrary to effect of such elements as sulphur, selenium and phosphorus, lead improves machinability without adversely affecting other physical properties, according to test results. The lead apparently acts as an internal lubricant to reduce friction between tool and steel as one means of improving machinability.

A new method of introducing chromium to steel promises to facilitate and lower cost of producing low-carbon high-chromium steels. This problem also has been worked on at Battelle. In this process, an intimate exothermic mixture of calcium chromite (with some chromate), calcium ferrite and ferro-chrome-silicon is introduced to the furnace at the time a chromium addition is desired. Heat of the furnace starts an exothermic reaction which reduces the chrome

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oxide and iron oxide and produces molten low-carbon ferrochromium and a calcium silicate slag. The molten ferrochromium does not chill the bath, and any quantity can be added quickly. It offers a means of producing the chromium steels on a tonnage basis and works equally well in open-hearth and electric furnaces.

Manufacturers of nonferrous metals are making increased use of water-cooled ingot molds both for casting individual ingots and continuous casting. According to E. R. Williams, president, Vulcan Mold & Iron Co., Latrobe, Pa., this development is confined to the nonferrous industry, but he expects the steel industry to take an interest in the subject shortly. Thus, he foresees the beginning of a radical change in casting of metals which may bring about revolutionary practice in the future.

A new method of pouring composite ingots has been reduced to experimental practice with encouraging results, comments R. E. Kinkead, consulting engineer, Cleveland. This process appears likely to find application in making stainless-clad structural steel and for seamless tubes with the stainless material on either the inside or outside. Mr. Kinkead also points out that welding experience has been applied to the problem of increasing the yield of ingots and reducing crop losses which occur because of pipe and segregations. The process has been reduced to practice and promises much.

Improved Soaking Pit Firing

Definite success in use of straight blast furnace gas in soaking pits is designated as the outstanding application of fuel in 1938 by A. L. Hollinger, manager, steel mill sales, Surface Combustion Corp., Toledo, O. A battery of 1-way fired soaking pits using this fuel has operated nearly a year, and no provision has been made for enriching the gas with a higher B.t.u. fuel, he states, which is unique in such applications. He predicts a wide-spread acceptance of this outlet for blast furnace gas inasmuch as speed in heating is as fast as that of reversing pits fired with coke oven gas at the plant in question.

A long step forward in mechanization of large heating furnaces was taken last year, he states, when two walking-beam furnaces, 25 x 80 feet, for heating of rounds for piercing were placed in operation. Compared with the conventional "roll-down" furnaces for this operation, the saving in labor is obvious and the installation indicates a trend.

In commenting on the forward outlook, Mr. Hollinger believes the

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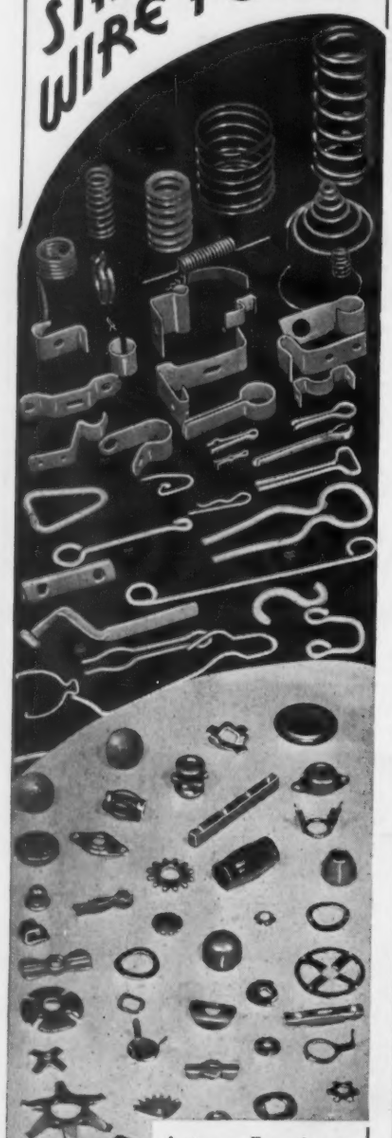

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most revolutionary improvement in steel mill practice this year will be along the lines of pickling. While the development has just advanced from the laboratory stage, he predicts a widening use of gas instead of liquid solutions for removing scale.

Ingot heating has been simplified by development of "dual temperature control," states P. M. Offill, vice president, Amsler-Morton Co., Pittsburgh. Maximum and minimum furnace temperatures are automatically controlled in conjunction with combustion and pressure control to produce a combined operation and record of a complete heat saturation of the ingot from surface to core and top to butt.

In this development, Mr. Offill explains, is a new and practical method of arriving at predetermined ingot temperatures within practical limits over an adjustable range of rolling temperatures for various grades of steel. He states this system has been in operation for over a year and has developed considerable information upon relation of furnace atmosphere and time and temperature factor with respect to formation of primary and secondary scale. In conclusion, he points out that ingot heating with 90 B.t.u. blast furnace gas (not preheated) has been made practical in a recuperative pit by preheating the combustion air to 1950 degrees Fahr.

Boosts Tin Plate Output

John L. Young, manager machinery sales, United Engineering & Foundry Co., Pittsburgh, directs attention to the principal development in rolling mill and accessory groups as centering in the processing and shearing departments. He emphasizes that the recently developed rotary synchronized type of tin plate flying shear has increased speed and production in tin plate departments, and expresses the view that more of these units will be installed by tin plate makers this year.

Further experiments in electrolytic tin plating of strip were completed in 1938, more or less under cover. Real progress has been shown, Mr. Young declares, and possibly this year this method of coating will become more prevalent. Last year also brought to light the development of equipment for handling nonferrous metals in and out of mills as well as a 4-high mill for hot and cold reduction of duralumin sheets.

An important development in electrical applications in the steel industry, as cited by L. A. Umansky, industrial department, General Electric Co., Schenectady, N. Y., is the automatic power factor control used on the alternating-current side of motor generator sets furnishing power to finishing mill drives at wide strip mills. By automatically adjusting excitation of synchronous motors driving these sets in proportion to the load which these sets carry, it is possible to obtain better voltage regulation on the high-voltage system and to operate equipment at an average power factor much closer to unity.

Electrical equipment also has been developed to facilitate inspection of tin plate for pinholes. It is installed in conjunction with the shearing and classifying line and consists of a "scanning head." The latter includes several phototubes located above the strip, and of various light sources located beneath the strip. Minute pin holes as small as 1/64-inch can be detected in a moving strip up to 900 feet per minute. Defective sheets are diverted automatically to a pile of rejects.

More Galvanized Strip Steel

From a steel mill executive in the Pittsburgh district comes this observation. Operating attention during the last year was focused on reduction of costs, consolidating positions as to organization and personnel and a struggle to meet consumer demands as to quality. He points out the increasing interest in the electroplating of tin plate, installation of modern galvanizing units and increased percentage of strip steel being galvanized. He directs attention to the fact that price adjustments made in lapweld pipe and seamless tubes last July are influencing the comparative percentage production of these products and that eventually this influence will be reflected in new equipment plans.

L. M. Gumm, manager metalworking section, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., states that developments in the steel industry in 1938 reflected the low rate of operations—major developments were relatively few. With an improved outlook, 1939 should see considerably greater activity, particularly along the following lines:

(1) Improvements aimed at reducing cost of production; (2) rounding out of production facilities, notably installations of slabbing mills to provide the large size slabs needed for present hot mills, as well as additional finishing mill equipment to bring this capacity up to that of the hot mills; and (3) refinements in finished product as specifications continue more exacting, and considerable activity in processing and finishing departments with developments in pickling, cleaning and tinning processes.

That the steel industry will share with other industries in benefits de-

rived from important developments of 1938, is the contention of W. H. Burr, superintendent electrical department, Lukens Steel Co., Coatesville, Pa. Higher standards of lighting are sure to be realized as a result of the introduction of the fluorescent mazda lamp.

Use of the new fiber glass insulation for windings on generators, motors and possibly transformers may even result in re-rating electrical equipment, Mr. Burr states. Use of condensers to provide definite limit acceleration for control equipment is meeting with general approval. Use of positioners to facilitate welding operations is increasing. A polyspeed alternating-current motor of small size has been made available to eliminate losses resulting from conversion of alternating current to direct current.

Forging

(*Continued from Page* 190)

Alliance, O. Scope of this development has been far-reaching and many companies find they can now use forgings advantageously whereas formerly it was considered a physical impossibility to forge the items because of their intricate contours and precise tolerances.

New features in hammer design provides increased rigidity and closer adjustment tolerances. Larger hammers are being built and these make it possible to produce the large forgings used in the heavy equipment and transportation industries with a considerable saving in steel and reduction in machining time. A further increase in forging usage is anticipated this year, Mr. Thompson declares.

Considerable progress in production of forgings this past year had centered on elimination of machining operations, states John A. Webber, metallurgical engineer, Interstate Drop Forge Co., Milwaukee. Principal ways of accomplishing this are coin pressing and hot shearing to remove draft and holding trimming and punching dimensions to close tolerances.

It is becoming common practice to pierce straight holes with sufficiently close tolerances that the boring operation can be eliminated, the broaching operations being performed on the forgings as received. Coin pressing has made rapid strides in eliminating machining, Mr. Webber asserts. Principal application of this, of course, has been on parallel surfaces, but other ingenious applications have been worked out satisfactorily.

Looking ahead, Mr. Webber says it is possible that in the near future a combination of forging and welding may find definite application as

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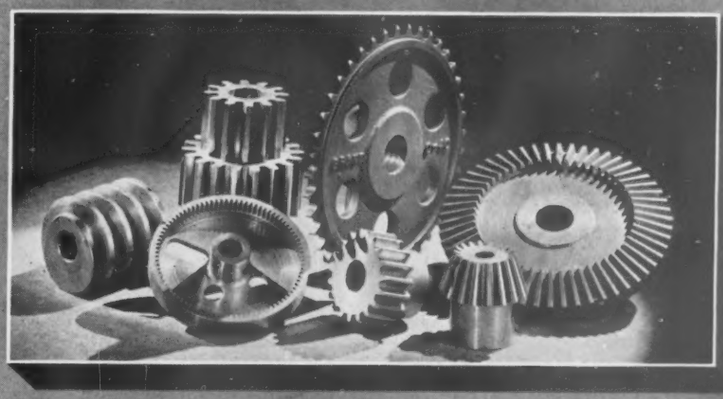

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a fabricating process. It appears likely that intricate shapes, now not made by forging, may be made up of several forgings welded together to provide units having advantages of forgings.

Although certain definite improvements in production of drop and upset forgings have been realized in 1938, these consist of refinements rather than noteworthy advancement in mechanical processes, in the opinion of M. A. Monaghan Jr., vice president, Mondie Forge Co., Cleveland. Outstanding evidence of progress, he says, is found in the expanding use of forgings by manufacturers of a wide variety of equipment and products.

Convinced that manufacturers of equipment can improve their product and manufacturing practice through intelligent use of forgings, some forgings makers have been successful in establishing a trend among manufacturers to use more forgings. As a result, Mr. Monaghan observes that the producers of drop and upset forgings who have been most active along these lines have experienced more than a normal increase in business amounting to several hundred thousand dollars worth of orders.

This accomplishment, despite adverse business conditions early in the year, he contends, certainly indicates that forgings are receiving more recognition for reducing deadweight, for providing greater strength and stamina, and for effecting economies in finishing parts.

Trend in forging machine design and construction continues toward heavier and more powerful machines coupled with more accurate die alignment, increased speed in operation and ease and convenience in feeding, reports R. H. Jones, National Machinery Co., Tiffin, O. The modern high-duty type forging machine, he claims, has been lifted out of the upsetter class, and it is truly a new tool for making machine forgings to much closer limits. Not only is its productive capacity greater, but the forgings produced are so close to final size that many of the former expensive drilling, reaming and rough turning operations have been eliminated.

Presses Gaining in Favor

Continuing, he states that presses are becoming recognized as money savers on certain types of forging work. A press built by his company, he asserts, has established itself as an efficient means for producing nonferrous forgings, and recent developments indicate that it will be an increasing factor in mass production of many types of steel forgings. Cold and semihot coining on this same type press is gaining favor.

"Machining by pressure" is an expression heard with increasing frequency in forging circles, Mr. Jones declares. In fact, it is common to consider both the forging machine and press when determining the proper equipment for a given forging job. Frequently it is found that both machines are to be recommended—the forging machine for producing the low weight minimum finished forgings, and the press for coining them to tolerances comparable to those obtained on a machine tool.

In 1937, M. S. Reed, chief engineer, Erie Foundry Co., Erie, Pa., reported that high average size featured the steam drop hammers his company had built. This year, he states the trend has developed further. Two years ago, the average size hammer was less than 4000 pounds, last year the average was 7700 pounds, and during 1938 it jumped to over 15,000 pounds.

Considered in light that there are probably only about a dozen hammers in this country of 15,000 pounds or larger, Mr. Reed thinks this to be quite notable, but points

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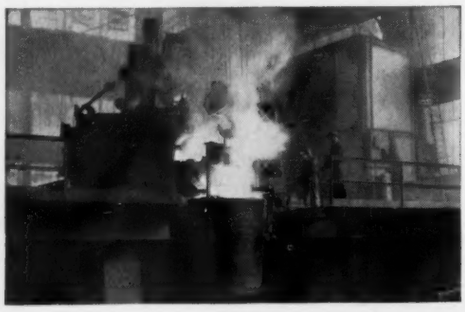

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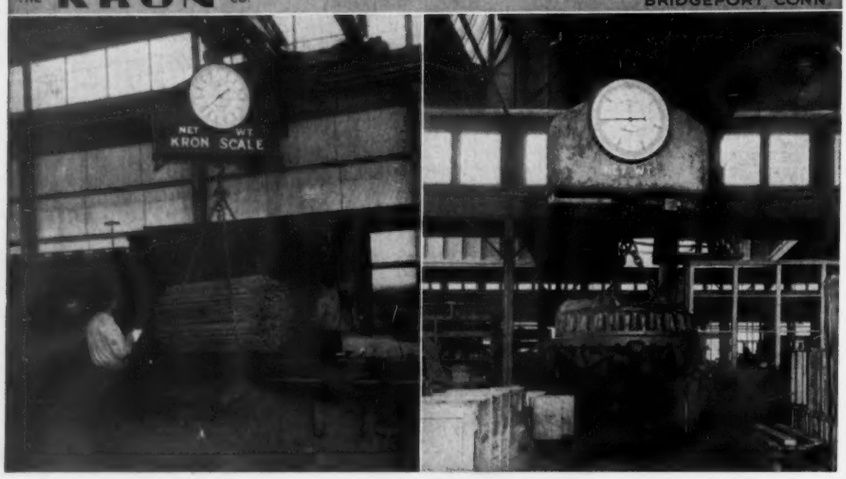

out that most of the hammers built this year were for export shipment. From the design point of view, his company's most noteworthy accomplishment was a 50,000-pound steam drop hammer. The average rating of board drop hammers in 1938 was about 2200 pounds, a 10 per cent increase over the average size for the previous year.

Modern drop forge shop equipment and practice is contributing appreciably to reduction of total costs in some shops, asserts R. E. W. Harrison, vice president, Chambersburg Engineering Co., Chambersburg, Pa., who points out that accelerated progress during the last few years has brought forging to the point where it can not be regarded as almost an exact science. Forgings become better and stronger from year to year, due to the advancement in alloying steels and in the ability to forge them effectively.

Forging equipment is basic but flexible and is adaptable to production of a wide range of products. Recent improvements in drop hammers, die materials and forging technique, Mr. Harrison declares, are resulting in the manufacture of forgings which are consistent as to size, hardness, scale and physical properties, and which require only a minimum amount of metal to be removed in machining. Coining, hot or cold, he emphasizes, is a most important operation in producing work within sufficiently close limits to reduce the amount of machining or in some cases make it unnecessary altogether.

Stamping

(*Continued from Page* 189)

steel is more costly to make, Mr. Poto points out, its development is desirable from the standpoint of its freedom from laminations, its uniform physical properties, the stability of these properties and its resistance to the return of stretcher strains.

Manufacturers of sheet and strip are continuing to bring out wider sheets, longer strips in coils, materials of close and consistent accuracy and high finish and stock with increased deep-drawing ability, it is observed. Use of coiled strip continues to open up new possibilities for automatic press equipment. Stamping speed has been tripled in some instances, scrap has been reduced, and products have been improved by the mechanical and metallurgical precision of modern strip stock.

Refinements in press design continue. It is predicted by R. B. Treer, consulting engineer, Lakewood, O., that the near future will disclose some highly improved designs, featuring attractive appearance and completely enclosed drive mechanisms as important sales points. Safety is being accorded more attention than ever. New regulations are being considered which would make it compulsory that all punch presses be so equipped that they could be stopped instantly at any position of the ram. This would necessitate the use of friction clutches or a changeover to hydraulic presses. Mr. Treer foresees development of new designs of engaging means that will equal or surpass the friction clutch as now used.

A general examination of the trend in production of small parts reveals a tendency toward greater speeds in high production presses, fitted with precision feeds and accurately designed tools. One punch press recently developed delivers 1200 strokes per minute and is a continuous feed machine. Stock passes continuously through the press, and dies follow work with an oscillating motion.

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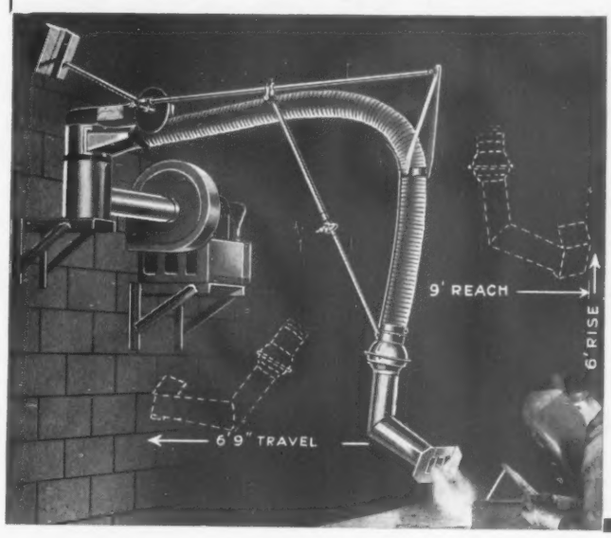

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operations, newest practice calls for the use of automatic feeds and follow dies on a single press rather than running work through a series of presses. In one example of combination stamping, a single press performs 16 stamping and forming operations on a strip and assembles the finished part with a nut to form a complete fastening unit.

In a Cleveland plant, presses incorporate the use of variable-speed transmissions. Because of the advantages of this setup, all drives are being changed over to this type. The variable feature permits slowing down of presses so that the operator can actually watch die operation. Thus he can set dies and clearances to obtain most satisfactory performance.

These new type drives make it possible to speed up presses to a maximum production, limited largely by ability of the equipment to discharge finished work. To aid in removing work from dies, synchonized air blasts are employed. Maximum speeds obtained with this equipment are said to be so high as to return initial investment on presses in from 60 to 90 days full-time operation.

There have been interesting developments recently in mechanical die sinking. One massive 154,000-pound pantograph machine duplicates intricate dies from masters to a sensitivity of 0.001-inch. Some dies are being cast to shape from alloys, one of the most satisfactory being chromium-nickel-molybdenum with a high steel base. Minimum tensile strength of this alloy can be raised from 50,000 to 75,000 pounds per square inch by heat treating. Alloy is close grained, takes a high polish, and its graphitic surface lubrication keeps dies from galling and "picking up."

Because of the speed and low cost of stamping and forming, and also because of the lightness of metal parts so produced, many fabricators recently have undertaken use of presses where other means of manufacture formerly were used. E. M. Tasker, vice president, Toledo Stamping & Mfg. Co., Toledo, O., reports an interesting adaptation of stamped and formed metal in the production of valve rocker arms for automobile engines.

This part is made up of two halves, formed from identical sheet steel blanks. A hub is drawn in each half, so that when the two pieces are copper hydrogen brazed together they form a complete arm and hub ready to receive a bushing. Hole is sized so accurately in in the drawing operation that machining is unnecessary. Oil ducts are coined in each half, so that when brazing is finished a complete oil line is formed, thereby eliminating a drilling operation.

Production Costs Reduced

Improvement in drawing steel, finer die materials available today, copper hydrogen brazing and ability to produce such parts in a minimum number of operations have made possible production at a savings of from 25 per cent upwards over former methods, according to Mr. Tasker.

Copper hydrogen brazing has found application recently in the building up of solid parts for electrical machines from stamped steel laminations. Advantages claimed for this process are low cost, and homogeneity and strength of the part produced. It is said that in brazing the steel laminations together at high temperatures, a normalizing action takes place which adds greatly to the strength of the finished part by actually changing the metal's grain structure.

Die Casting

(*Continued from Page* 208)

of zinc alloys and their excellent properties lead some die casters to use them exclusively and others to apply them in all cases in which they meet customer requirements. Where light weight is a factor, aluminum is chosen, as a rule, but magnesium alloys, which are still lighter, find occasional and perhaps increasing use. Alloys based on copper probably rank next in volume cast, although the total is not great relatively. Brass die castings, however, still rank first in strength and corrosion resistance, but are comparatively high in cost and involve high cost of die construction and maintenance."

Pointing to the diversity of die castings uses, Mr. Chase cites the case of a manufacturer of business machines with a new product reported to use die castings from 137 different dies.

On the score of magnesium-base die castings, considerable progress has been made in the past year, and observers are inclined to foresee a "fertile field" for this type of material in the coming year. The Hoover Co., North Canton, O., is now building two models of vacuum cleaners containing up to five magnesium alloy die castings per unit. They are finished on exposed surfaces with baked-on enamel of the "wrinkle" type.

A. W. Winston, metallurgical department, Dow Chemical Co., Midland, Mich., mentions this development and notes that other makes of cleaners also are using this type of casting, although to a lesser extent. He adds that the rapid strides made in casting of magnesium alloys have been possible through the use of high-pressure equipment whereby pressures from 3000-10,000 pounds per square inch are applied to the molten metal.

The Dow company recently has introduced a new die casting alloy, known as Dowmetal R., which is claimed to have higher physical properties than previously obtainable.

Gordon C. Curry, manager of casting sales, Hoover Co., in referring to the use of these castings on vacuum cleaners, declares magnesium castings are in their infancy, and the time has arrived for a constructive educational program ad-

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vising prospective users of their possibilities.

On other phases of die casting, Mr. Curry states, "It is our belief that in the die casting of aluminum by the pressure-type machine industry is going to see in the near future certain developments that may be revolutionary. Physical properties of such castings will be improved and, owing to the difference in weight, the field for aluminum die castings will be enlarged greatly.

"It is our further feeling that steel manufacturers will spend considerable time in developing better die steels which will give longer runs in production before checking occurs."

D. L. Colwell, Stewart Die Casting Corp., Chicago, observes: "Marked progress was made during 1938 in more economical and superior methods of finishing zinc-base die castings. The use of the bright nickel bath made rapid strides and, consequently, costs of finishing by nickel and chromium plating were decidedly lower. Synthetic finishes are now available which will protect zinc-base die castings from almost any type of corrosion, and which have made their application for washing machine agitators and similar parts entirely feasible. It is even suggested that die cast pump impellers could be used for alkaline or acid solutions which would corrode any other metallic material if given this synthetic lacquer protection."

Magnesium Moves Forward

Agreeing that major advances have been made in the field of die casting magnesium, Charles Pack, vice president, Doehler Die Casting Co., New York, asserts that "definite progress has been made during the year in finishing magnesium die castings, both for corrosion resistance and for ornamental purposes. Magnesium alloys have been plated successfully with chromium, nickel and copper, although the process has not yet been adopted commercially."

Continuing, Mr. Pack says, "Brass die castings also continue to find broader fields. Special brasses adapted to die casting give remarkable physical properties. High tensile strength and good bearing qualities permit these die cast brasses to replace the tin-bearing bronzes."

F. W. McIntyre, vice president and general manager, Reed-Prentice Corp., Worcester, Mass., points out that "the old method of forcing aluminum into dies with air pressure of about 500 pounds is gradually being superseded by the positive-plunger type of machine producing pressure in the range of 5000-10,000 pounds per square inch, thereby eliminating porosity and giving a more dense surface and better finish on the castings.

"On the zinc-type machines the tendency is toward a semiautomatic design where the operator starts the machine, closes the mold, operates the plunger mechanism and allows, through a timing clock, a predetermined period for proper solidifying, return of plunger and opening of dies for the next cycle.

"Larger and more intricate castings have been produced by a Cleveland company on a Reed-Prentice No. 2 machine—castings weighing up to 12½ pounds for use by a large manufacturer of musical instruments.

"Brass die casting machine development has also progressed, as die steels are now obtainable for giving satisfactory production on brass castings of 60-40 analysis. Machines with sufficient capacity to operate a multiple-cavity dies are proving successful. One such unit weighs approximately 50,000 pounds and produces in one cycle up to twenty 1½-inch hexagon nuts in a multiple-cavity die. Savings in material and processing over sand casting in some cases are reported to reach as high as 35 per cent."

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Steelworks Expansion

(*Concluded from Page 218*)

National Works: Additional new special finishing equipment for shrink weld and shrink grip drill pipe and other special joints, and transferring finishing equipment from pipe mill finishing department and installation in electric weld building at Christy Park department.

Underway

Ellwood Works: Changes and improvements to No. 5 seamless mill for production of finished tubes of 50 feet length.

Lorain Works: Changes to stock yard facilities, new charging machines, pouring cranes, ladle, narrow gage tracks for producing and handling increased open-hearth tonnage.

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AMERICAN STEEL AND WIRE CO.

Completed

Cuyahoga and Donora Wire Works: Additional heat treating equipment for rods and wire.

Underway

Cuyahoga Works: Extension and improvements of cold strip facilities.

Worcester Electric Cable Works: Additional facilities for manufacturing asbestos insulated wires and cables.

TENNESSEE COAL, IRON AND R. R. CO.

Completed

Ensley Works: Relining No. 6 stack.

Underway

Various: 45 Mechanical coal conveyor units at Wyland, Docena and Edgewater mines.

Fairfield Works: Processing line at sheet mills for drum stock. Relining No. 5 blast furnace.

COLUMBIA STEEL CO.

Underway

Seattle Warehouse: Warehouse building.

REPUBLIC STEEL CORP.

Completed

Youngstown: No. 3 blast furnace enlarged to 900 tons. Old battery of 61 by-product coke ovens replaced with new unit of 69 ovens.

Warren: Installed additional equipment for processing and finishing stainless steel. Improvements made to No. 1 hot strip mill.

Central Alloy: Modernization of blast furnace completed. Wheelabrator for processing sheets for galvanizing.

Cleveland: Completed a 30-inch gas line, 9300 feet long, from main steel plant to strip mill. Enlarged three open-hearth furnaces. Installed 156-inch plate shear at strip mill.

Buffalo: Improvements to and enlargements of open-hearth cranes.

Gulfsteel: Bolt manufacturing equipment installed. Enlargement of sheet mills completed.

Steel & Tubes Inc.: Additional welding equipment for tubemaking. Boiler tube department enlarged.

Truscon: Equipment for manufacturing double hung sash. Rearranged various departments to improve straight-line production. Installed new bonderizing equipment.

Niles Steel Products: Extension to buildings and installation of equipment for making containers. New hi-bake ovens.

Union Drawn: New stainless steel department installed.

Canton Culvert: Equipment for manufacturing triple clad culverts. Galvanizing department and new plant for manufacturing sectional plate culverts.

Underway

Youngstown: New light-oil recovering plant at coke works.

Warren: Welding equipment for joining strip steel coils.

Cleveland: Coil-welding equipment for strip mill.

Gulfsteel: Rebuilding plate mill heating furnaces. New buildings to house plant for making wire mesh for road and building work.

AMERICAN ROLLING MILL CO.

Completed

Open Hearth: Area of mold yard increased 4224 square feet.

Soaking Pit: Area of pit building increased 4032 square feet and new 4-hole soaking pit installed.

Blooming Mill: Extension to motor-room building. Foundations for electric drive.

Bar Mill: Linde scarfing machine.

Strip Mill: Size of mill motors increased. New mill spindles and boxes. New up-type coiler installed.

Hot Reducing Processing: Automatic side and end-cut shear rebuilt and relocated. One 4-high temper sheet mill complete with tables and roller leveler (transferred from Butler, Pa., division). Heavy-gage pickler rebuilt.

Cold Strip Processing: New annealing, pyrometer, transfer, maintenance, temper and shipping, lumber storage, locker and office and substation buildings. Two 50-ton and three 15-ton overhead cranes installed.

Underway

Blooming Mill: New electric drive. New slabbing mill and edging mill complete with tables.

Bar Mill: Larger mill motors. Relocation of bar mill stands and new transfer tables. Heating furnace. New slab and bar-plate shears.

Strip Mill: One new up-type hot coiler.

YOUNGSTOWN SHEET & TUBE CO.

Completed

Brier Hill Works: Intermediate blooming mill, alterations to billet mill for rolling tube rounds.

Campbell Works: Double piercing mill at No. 2 seamless division to replace Pilger process.

Indiana Harbor Works: One 2-stand 4-high skin pass mill with shear lines and five batteries of annealing furnaces.

Underway

Indiana Harbor Works: 10-stand 54-inch continuous hot strip mill with finishing equipment.

JONES & LAUGHLIN STEEL CORP.

Completed

Pittsburgh Works: Steelworks department revamped. Additional tar topping plant added at by-product plant. Two stacks relined.

Aliquippa Works: Obsolete wire drawing frames replaced with modern continuous units.

Memphis: Completed new warehouse for ammonia sulphate.

Muncy Works: New plant for making full line of wire rope.

Vesta Mines: Ventilating shafts at No. 4 mine completed.

BETHEHEM STEEL CO.

Completed

Steelton Plant: Scrubber and electric precipitator at blast furnace A.

Lebanon Plant: Extension to forging department for sucker rod production.

Maryland Plant: Wire cleaning and baking unit; bar bending equipment; mold yard and stripper building at No. 1 open-hearth department.

Lackawanna Plant: Sheet galvanizing unit.

Cambria Plant: Enlargement of axle department; additional finishing facilities for rolled steel wheel department; acetylene and oxygen distributing system for Franklin car shops and mills; four rod coilers.

Underway

Steelton Plant: 4000 h.p. boiler plant and new steam lines.

Lebanon Plant: One 3000 k.w. turbine and additional boiler.

Maryland Plant: Three benzol washers; electric butt welder for pipe mills; six wire straighteners and cutters.

Lackawanna Plant: Strip welder in pickling line at strip mill.

MISCELLANEOUS COMPLETED

Ford Motor Co.: Six open-hearth furnaces enlarged to 175 tons. Improvements to bleeder valves and miscellaneous gas piping at "A" and "B" stacks.

Rotary Electric Steel Co.: Added one 30-ton electric furnace to melting capacity.

Wickwire Brothers: Installed new nail machines.

Firth-Sterling Steel Co.: Replaced old heating furnaces with controlled atmosphere furnaces for heating ingots, billets and slabs preparatory to hammering and rolling.

Central Iron & Steel Co.: Two 150-horsepower fire tube waste-heat boilers. One 600-ampere arc welding machine, one pipe threading machine and a motor-driven lathe.

Otis Steel Co.: Improvements completed include a 77-inch hot cutup line, one 76-inch and one 42-inch cold cutup line, widening the continuous pickler from 72 to 80 inches, and the installation of a still gas mixing station.

Inland Steel Co.: New stoves, gas washers and turboblower at new 1000-ton stack. Waste heat boilers for each of five new open hearths; 1200-ton mixer.

Wickwire Spencer Steel Co.: New building of 200,000 square feet floor area to be under way at Buffalo to house additional wiremaking facilities.

Construction and Enterprise

Ohio

BELLEVUE, O.—City, R. E. Woleslagel, mayor, will soon set date for referendum on construction of power plant, purchase of distribution system and erection of new white way to cost total of $680,000. Western Construction Engineering Co., Toledo, O., consulting engineer. (Noted Oct. 17.)

CUYAHOGA FALLS, O.—City, Kenneth Ewart, service director, has received PWA allotment and is drawing up plans for construction of a sewage disposal system costing total of $305,000. Project includes 2,000,000-gallon treatment plant, chemical and sludge plants. E. D. Barstow, Akron, O., consulting engineer.

DAYTON, O.—Army air corps, materiel division, contracting officer, Wright field, takes bids until 10 a. m., Jan. 10, on one duplex universal milling machine with 220-volt motor drive, and on a horizontal universal milling machine.

New York

NIAGARA FALLS, N. Y.—Hooker Electro-Chemical Co., Buffalo avenue, proposes to build an addition to its plant to cost more than $100,000 with necessary equipment. W. A. Cannon, Niagara Falls, architect and engineer.

WHITE PLAINS, N. Y.—Westchester county water commission plans to construct a water supply system costing more than $500,000 for its new reservoir. M. Pirnic, New York, engineer.

Pennsylvania

BLOSSBURG, PA.—J. P. Ward Foundry Co., C. Ward, president, will rebuild its foundry which was recently destroyed by fire with loss of nearly $300,000. Considerable new equipment will be purchased for installation in new structure.

Illinois

HARRISBURG, ILL.—Southeastern Illinois Electric Co-operative Inc., A. E. Drennan, president, will soon take bids on construction of 627 miles of rural electric power lines serving nine counties. Cost about $811,000; REA allotment approved.

Alabama

MOBILE, ALA.—State docks commission has approval of state public works board, Montgomery, Ala., to issue $200,000 bonds tc finance docks extension project. Includes sheds and docks, tracks and handling equipment.

MONTGOMERY, ALA.—City, William Gunter, president of commissioners, receives bids Jan. 5 on Contract No. 2 for certain waterworks extensions, and on Jan. 17 for other waterworks improvements. Total of $40,000 available.

Maryland

BALTIMORE — American Zirconium Corp. will erect an addition to its Helena avenue warehouse. One-story structure to be steel and tile, 21 x 137 feet.

Mississippi

CARROLLTON, MISS.—City plans to build a waterworks and sewerage system in North Carrollton and voters recently approved a $20,500 bond issue to finance project.

LAUREL, MISS.—Jones County Electric Power association, F. Holt, Montgomery, Miss., representative, has $190,000 REA allotment for construction of 230 miles rural electric lines in the county.

TISHOMINGO, MISS. — Tishomingo county has been granted $78,000 REA allotment to finance construction of additional rural power transmitting lines.

District of Columbia

WASHINGTON—Navy department, bureau of supplies and accounts, asks bids to Jan. 10 on drill presses (schedule 5139); milling machines (schedule 5140); hydraulic presses (schedule 5149); pipe expanding and flanging machine (schedule 5158); chain hoists (schedule 5159); and on hydraulic test pumps (schedule 5194).

Tennessee

COVINGTON, TENN.—Citizens Ice Co., Mal Smith, representative, has plans for construction of storage locker and refrigeration plant containing 300 units and costing $10,000.

KNOXVILLE, TENN.—City has plans to improve its waterworks pumping plant and machine shop at cost of $125,000 and will accept bids until Jan. 12.

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Burns & McDonnell, Kansas City, Mo., consulting engineers in project.

TRIMBLE, TENN.—City, H. Gauldin, mayor, receives bids for construction of projected water treatment plant. Thomas H. Allen, Memphis, Tenn., consulting engineer.

Louisiana

GRETNA, LA.—Jefferson parish sewerage district No. 1 plans to construct a sewage disposal plant costing $500,000. G. P. Price, Baronne building, New Orleans, consulting engineer.

PLAQUEMINES, LA.—Parish police jury receives bids Jan. 3 for construction of three pumping plants, each to have one 30,000-gallon capacity pump. James Todd, New Orleans, consulting engineer.

Georgia

ATLANTA, GA.—National Battery Co., 1060 Murphey avenue, will soon let contract for constructing a one-story 90 x 190-foot, brick and steel plant costing $50,000.

North Carolina

HIGH POINT, N. C.—City, C. S. Grayson, mayor, receives bids for construction of proposed hydroelectric power project on Yadkin river, estimated to cost $6,500,000. (Noted Nov. 7.)

Virginia

STAUNTON, VA.—City, George Cottrell, mayor, receives bids Jan. 10 on Contract No. 3 for construction of sanitary sewerage system for which $109,000 is available; includes settling and chlorination tanks. Whitman, Requardt & Smith, Baltimore, consultants.

Missouri

KANSAS CITY, MO.—United Light & Power Co., 1330 Baltimore street, plans to construct a new river intake for its power plant at cost of $150,000. Will take first bids soon.

Wisconsin

APPLETON, WIS. — Appleton Wire Works, maker of screens for paper mills, is building two additions to its plant, one 25 x 120 feet, the other 20 x 50 feet.

CUMBERLAND, WIS.—City, Mrs. K. D. Cavanaugh, clerk, has rejected bids opened recently on construction of projected diesel power plant and is receiving new bids. Cost estimated at about $100,000. (Noted Nov. 7.)

PRAIRIE DU CHIEN, WIS.—Tri-state Power co-operative, F. P. Wood, Washington, REA engineer, plans to construct a $500,000 electric power generating plant to serve certain counties in Wisconsin, Iowa and Minnesota.

Texas

AUSTIN, TEX.—Lower Colorado river authority, Littlefield building, receives bids on water supply pipe and appurtenant equipment and accessories for installation at Austin dam.

CUERO, TEX.—City, J. T. Newman, mayor, is receiving bids for construction of electric distribution system for which available funds total $134,000. Garrett Engineering Co., Houston, Tex., consulting engineer in project. (Noted Nov. 28.)

SAN ANTONIO, TEX.—Waterworks board, W. Masterson, manager, proposes to build a 15-million gallon per day pumping station costing about $180,000.

Nebraska

OMAHA, NEBR.—Paxton & Vierling Iron Works plans to build and equip a plant comprising steel shop, machine shop and foundry and costing about $125,000.

Colorado

DENVER—Bureau of reclamation takes bids to Jan. 19 on four 75,000-kilovolt amperes, 60-cycle alternating current generators for installation at Shasta power plant, Central Valley project, California. Specification 816.

Pacific Coast

SEATTLE—Kirsten Pipe Co., 1000 Virginia street, has been incorporated with capital of $10,000 by George Gunn Jr. and associates.

SEATTLE—Puget Sound Shipbuilding Co., c/o chamber of commerce, has acquired plant of Wallace Bridge & Structural Steel Co. and plans to convert it into a shipbuilding plant at total cost of over $350,000. E. R. Gayler, engineer, care of owner.

Canada

SASKATOON, SASK. — Saskatchewan power commission, care of L. A. Thornton, 1739 Cornwall street, Regina, Sask., is asking bids on construction of a power plant and installation of a new boiler at total cost of approximately $250,000.

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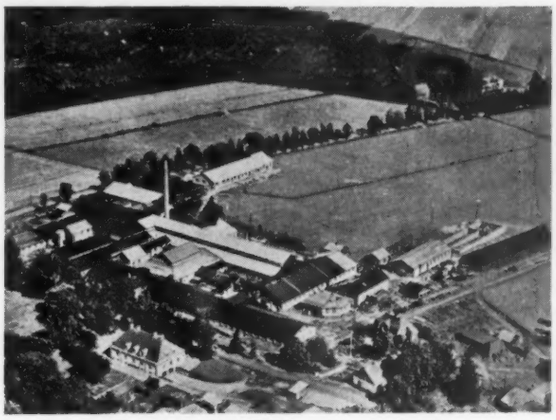

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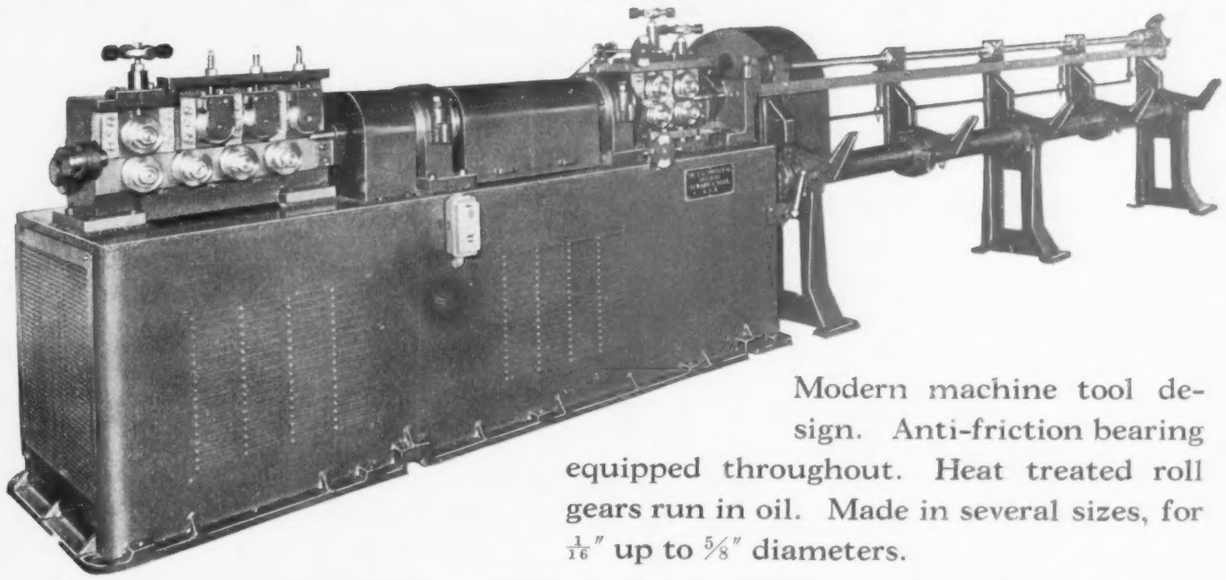

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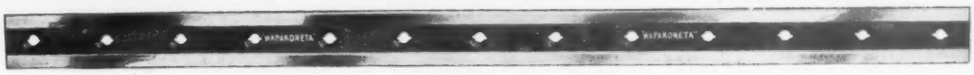

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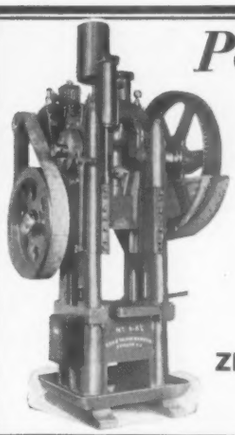

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Keystone Steel & Wire Co., Peoria, Ill.
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Republic Steel Corp., Dept. ST, Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Washburn Wire Co., Phillipsdale, R. I.

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Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
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Jones and Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Burnham, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
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Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
*Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
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Standard Steel Works Co., Burnham, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
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*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
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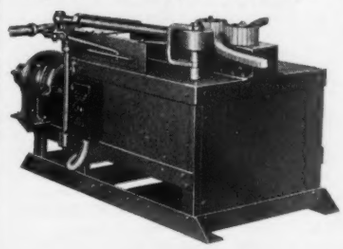

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Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

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Koppers Co., The, Gas & Coke Div., Pittsburgh, Pa.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Coal Co., Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Pickands, Mather & Co., Union Commerce Bldg., Cleveland, O.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
Koppers-Rheolaveur Co., Pittsburgh, Pa.

COKE—See COAL OR COKE

COKE OVEN MACHINERY
Alliance Machine Co., The, Alliance, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COKE OVENS (By-Product)
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COKE SCREENING PLANTS
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

COMBUSTION BULBS
Norton Company, Worcester, Mass.

COMBUSTION CONTROLS
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Norton Company, Worcester, Mass.

COMPARATORS (Optical)
Jones & Lamson Machine Co., Springfield, Vt.

COMPENSATORS (Automatic)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Gas Furnace Co., Elizabeth, N. J.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Compressor Corp., Harrison, N. J.

CONCRETE REINFORCING BARS—See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

CONDUITS (Pressure-Treated Wood)
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Leard, Wm., Co., Inc., New Brighton, Pa.
Mesta Machine Co., P. O. Box 1124 Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Burnham, Pa.
Transue & Williams Steel Forging Co., Alliance, O.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

CONTROLS (Variable Speed)
Reeves Pulley Co., Columbus, Ind.

CONTROLLERS (Combustion)
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.

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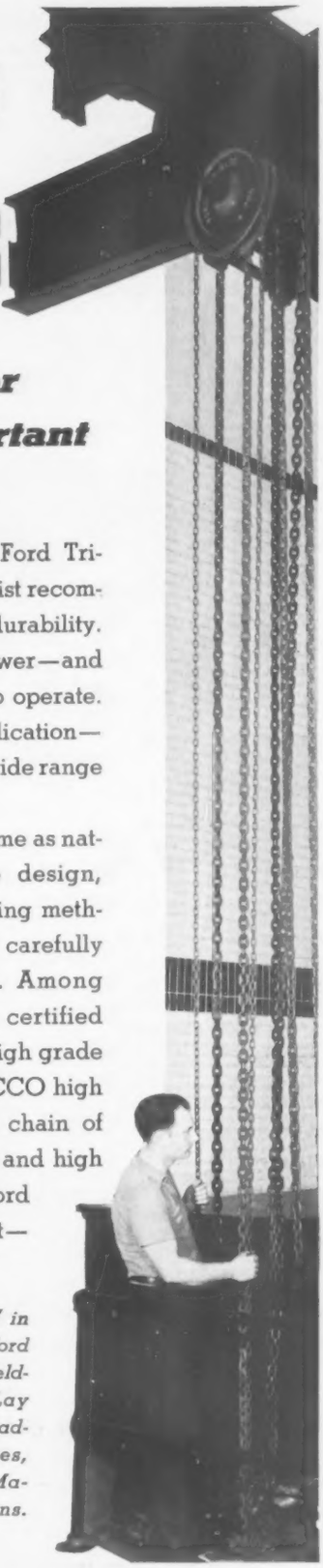

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Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Oven)
Paul Maehler Co., 2210 W. Lake St., Chicago, Ill.

CONTROLS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

CONVEYOR BELTS (High and Low Temperature)
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

CONVEYOR BELTS (Wire)
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

CONVEYORS (Apron)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Magnetic)
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

CONVEYORS (Roller—Power and Gravity)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

COPPER (Phosphorized)
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

COPPERING COMPOUND
American Chemical Paint Co., Ambler, Pa.

COTTER PINS
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

COUPLERS (Hose, Instantaneous—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLERS (Valving, Safety—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
General Electric Co., Schenectady, N. Y.
Hilliard Corp., The, 100 W. 4th St., Elmira, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Poole Fdy. & Mach. Co., Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas
Republic Steel Corp., Dept ST, Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
Alliance Machine Co., The, Alliance, O.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
Alliance Machine Co., The, Alliance, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES (Creeper, Erection)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Electric)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Erie Steel Construction Co., Erie, Pa.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Gantry)
Alliance Machine Co., The, Alliance, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES (Gasoline and Diesel)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Hand)
American Chain & Cable Co., Bridgeport, Conn.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo
Industrial Brownhoist Corp., Bay City, Mich.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa

CRANES (Jib)
Alliance Machine Co., The, Alliance, O.
American Chain & Cable Co., Bridgeport, Conn.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Locomotive)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Monorail)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.
Shepard Niles Crane & Hoist Corp. Montour Falls, N. Y.

CRANK SHAFTS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Leard, Wm., Co., Inc., New Brighton, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Transue & Williams Steel Forging Co., Alliance, O.
Union Drawn Steel Co., Massillon, O.

CRUSHERS
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

CRUSHERS (Ring)
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

CUPOLA BLOCKS
McLain Fire Brick Co., Gulf Bldg., Pittsburgh, Pa.

CUTTERS (Bar, Iron Hand)
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

CUTTERS (Die Sinking & End Milling)
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.
Barber Colman Co., 150 Loomis St., Rockford, Ill.

CUTTERS (Gang Slitter)
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

CUTTERS (Keyseating)
Davis Keyseater Co., 399 Exchange St., Rochester, N. Y.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CYLINDERS (Air and Hydraulic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co. Milwaukee, Wis.

DEGREASERS
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., New York City.

DIE BLOCKS
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Burnham, Pa.

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.

DIE-SINKING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

DIES (Cast)
Advance Foundry Co., The, 100 Parnell Ave., Dayton, O.
Farrel-Birmingham Co., Inc., 110 Maine St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.

DIES (Punching, Stamping, Blanking)
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.

DOLOMITE (Flux and Refractories)
Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

DOORS FOR COKE OVENS (Automatic Self Sealing)
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

DOORS & SHUTTERS (Steel—Fire Rolling)
Kinnear Mfg. Co., 818 Field Ave., Columbus, O.

DRILL RODS—See RODS (Drill)

DRILLING MACHINES (Multiple, Heavy Duty)
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLING MACHINES (Radial)
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gears)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co., Westfield, N. Y.

DRUMS (Magnetic)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Stearns Magnetic Mfg. Co., The, 650 So. 28th St., Milwaukee, Wis.

DRUMS (Steel)
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

DUST ARRESTING EQUIPMENT
American Foundry Equipment Co., Mishawaka, Ind.
Research Corp., 405 Lexington Ave., New York City.
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., 19 Rector St., New York City.

WHERE-TO-BUY

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1326 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blakley, Dilworth & Co., Rock Hall, Md
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

ENGINEERS (Consulting)
Aetna-Standard Engineering Co., The, Youngstown, O.
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINEERS, CONSULTING (By-Products Coke Oven & Gas Plants)
Koppers Co. Engineering and Construction Div., Pittsburgh, Pa.

ENGINES (Diesel)
Cooper-Bessemer Corp., Mt. Vernon, O.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

FACING MACHINES (Structural)
Thomas Machine Mfg. Co., Pittsburgh, Pa.

FANS (Portable)
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.

FENCING (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Cyclone Fence Co., Waukegan, Ill.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Superior Iron & Wire Works, The, 39 Pride St., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

FERROALLOY (Briquets)
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

FERROALLOYS
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Driver-Harris Co., Harrison, N. J.
Electro-Metallurgical Sales Corp., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROPHOSPHORUS
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FERROSILICON
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Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROSILICON ALUMINUM
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FERROTITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROVANADIUM
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Vanadium Corp. of America, 420 Lexington Ave., New York City.

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Nicholson File Co., Providence, R. I.

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FILTER CLOTH (Metallic)
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.

FIRE CLAY
West Virginia Fire Clay Mfg. Co., Diamond Bank Bldg., Pittsburgh, Pa.

FIRE DOORS AND SHUTTERS —See Doors and Shutters

FLANGES (Forged Steel)
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.

FLANGES (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

FLASKS (Foundry)
American Foundry Equipment Co., Mishawaka, Ind.

FLOORING (Monolithic)
Johns-Manville Corp., 22 E. 40th St., New York City.

FLOORING (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp., Machinery Div., Dravo Bldg., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc. 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Dravo Bldg., Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc., Sharpsburg, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

FLUORSPAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Ambler, Pa.
American Solder & Flux Co., 4519 Wayne Ave., Philadelphia, Pa.

FORGING BILLETS—See BILLETS

FORGING MACHINERY
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Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

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Bridgeport Brass Co., Bridgeport, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

FORGINGS (Drop) (*Also Stainless)

*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Clapp, E. D., Mfg. Co., 86 Columbus Ave., Auburn, N. Y.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.
Transue & Williams Steel Forging Co., Alliance, O.

FORGINGS (Hollow Bored)

Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

FORGINGS (Iron and Steel) (*Also Stainless)

*Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranbery Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Clapp, E. D., Mfg. Co., 86 Columbus Ave., Auburn, N. Y.
Columbia Steel Co., San Francisco, Calif.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
*Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Leard, Wm., Co., Inc., New Brighton, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
Oliver Iron & Steel Corp., So. 10th and Muriel Sts., Pittsburgh, Pa.
Standard Steel Works Co., Burnham, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Transue & Williams Steel Forging Co., Alliance, O.

FORGINGS (Upset)

Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Transue & Williams Steel Forging Co., Alliance, O.

FROGS AND SWITCHES

Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

FURNACE BOTTOMS

Industrial Silica Corp., Stambaugh Bldg., Youngstown, O.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)

Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.

FURNACES (Electric Heating)

Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.

FURNACES (Electric Melting)

Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.

FURNACES (Forging)

American Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Galvanizing)

Salem Engineering Co., 714 So. Broadway, Salem, O.
Spowers, W. H., Jr., 551 Fifth Ave., New York City.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

FURNACES (Gas or Oil)

American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Industrial)

Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

FURNACES (Laboratory)

American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Non-Ferrous Melting)

American Gas Furnace Co., Elizabeth, N. J.

FURNACES (Open Hearth)

Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.

FURNACES (Recuperative)

Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Sheet and Tin Mill)

Aetna-Standard Engineering Co., The, Youngstown, O.
Electric Furnace Co., The, Salem, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Steel Mill)

Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Steel Treating, Annealing, Case Hardening, Tempering)

American Gas Furnace Co., Elizabeth, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNITURE (Steel)

Angle Steel Stool Co., The, Plainwell, Mich.

FURNITURE (Tubular Steel)

Harter Corp., The, Sturgis, Mich.
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

GAGES

Greenfield Tap & Die Corp., Greenfield, Mass.

GALVANIZING (Consulting)

Spowers, W. H., Jr., 551 Fifth Ave., New York City.

GALVANIZING (Hot Dip)

Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Asso., Inc., 903 American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattie, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.
Chain Products Co., The, Cleveland, O.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2507 E. Cumberland St., Philadelphia, Pa.
Thomas Gregory Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Penn Galvanizing Co., Philadelphia, Pa.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING COMPOUNDS

American Solder & Flux Co., 4519 Wayne Ave., Philadelphia, Pa.

GALVANIZING PLANTS (Designing)

Spowers, W. H., Jr., 551 Fifth Ave., New York City.

GALVANIZING PLANTS FOR SHEETS

Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GAS (Detarring)

Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GAS HOLDERS

Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

GAS PRODUCERS PLANTS

Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

GAS RECOVERY COKE OVEN AND GAS PLANTS

Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

GAS SCRUBBERS

Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Research Corp., 405 Lexington Ave., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GASKETS (Asbestos, Metal or Rubber)

Johns-Manville Corp., 22 E. 40th St., New York City.

GAUGES (Indicating and Recording)

General Electric Co., Schenectady, N. Y.

GEAR BLANKS

Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Standard Steel Works Co., Burnham, Pa.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)

Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.

GEARS (Non-Metallic)

Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GEARS (Spur, Bevel, Miter)

Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

GEARS (Steel Laminated)

Waldron, John, Corp., New Brunswick, N. J.

GEARS (Worm)

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, O.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

WHERE-TO-BUY

GEARS AND GEAR CUTTING
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., 2501 Liberty Ave., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

GENERATING SETS
Crocker-Wheeler Electric Mfg. Co., Ampere, N. J.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.

GENERATORS (Acetylene—Portable and Stationary)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

GENERATORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Crocker-Wheeler Electric Mfg. Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-1.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GRABS—for Sheets, Coils and Ingots
J. B. Engineering Sales Co., New Haven, Conn.

GRATING
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp., Machinery Div., Dravo Bldg., Pittsburgh, Pa.
Tri-Lok Co., Dravo Bldg., Pittsburgh, Pa.

GREASE (Lubricating—See LUBRICANTS (Industrial)

GREASE RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GRINDERS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

GRINDERS (Precision Thread)
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Surface)
Heald Machine Co., Worcester, Mass.

GRINDING COMPOUNDS
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Centerless, Internal and External)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Chucking)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Crank Pin, Cam, Piston, Valve Face)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Oscillating)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Plain and Universal)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Roll)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Landis Tool Co., Waynesboro, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Rotary Surface)
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Surface)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.

GRINDING MACHINES (Swing Frame)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

GRINDING MACHINES (Tool and Cutter)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING WHEELS
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

GRINDING WHEELS (Segment)
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
National-Erie Corp., Erie, Pa.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

HAMMERS (Chipping, Riveting, Calking)
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS (Drop)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HAMMERS (Power)
Yoder Co., The, 5500 Walworth Ave., Cleveland, O.

HAMMERS (Steam)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HANGERS
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HANGERS (Shaft)
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Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HARDENING—See Case HARDENING

HARDWARE SPECIALTIES
Peoria Malleable Castings Co., Peoria, Ill.

HEATERS (Air)
Babcock & Wilcox Co., 19 Rector St., New York City.
Maehler Co., Paul, 2210 W. Lake St., Chicago, Ill.
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.

HEATERS (Oven)
Maehler Co., Paul, 2210 W. Lake St., Chicago, Ill.
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.

HEATERS (Unit)
Dravo Corp., Machinery Div., Dravo Bldg., Pittsburgh, Pa.
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.

HITCHINGS (Mine Car)
American Chain & Cable Co., Bridgeport, Conn.

HOBBING MACHINES
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOBS
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOISTS (Chain)
American Chain & Cable Co., Bridgeport, Conn.
Ford Chain Block Co., York, Pa
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Electric)
American Chain & Cable Co., Bridgeport, Conn.
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Ford Chain Block Co., York, Pa.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Monorail)
American Chain & Cable Co., Bridgeport, Conn.
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Pneumatic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Ingersoll-Rand Co., 11 Broadway, New York City.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.

HOOKS (Chain)
American Chain & Cable Co., Bridgeport, Conn.

HOOPS (Welded Wire)
Keystone Steel & Wire Co., Peoria, Ill.

HOOPS AND BANDS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell St., Chicago, Ill.
Stanley Works, The, New Britain, Conn.
Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

HOSE (Rubber)
Goodrich, B. F., Co., The, Akron, O.
U. S. Rubber Products, Inc., 1790 Broadway, New York City.

HYDRAULIC EQUIPMENT
Logansport Machine Inc., Logansport, Ind.

HYDRAULIC MACHINERY
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

INDICATORS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

INDICATORS (Blast Furnace Stock Line)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Valley Mould & Iron Co., Hubbard, O.

INGOT PIPE ELIMINATORS
Alpha-Lux Co., 192 Front St., New York City.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York City.
Parkin, Wm., M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

INSTRUMENTS (Electric Indicating and Recording)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

INSULATING BLOCK
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

INSULATING BRICK
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

INSULATING POWDER AND CEMENT
Armstrong Cork Products Co., Lancaster, Pa.
Babcock & Wilcox Co., 19 Rector St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON (Ornamental)
Superior Iron & Wire Works, The, 39 Pride St., Pittsburgh, Pa.

IRON (Swedish)
Swedish-American Steel Corp., 427 Kent Ave., Brooklyn, N. Y.

IRON ORE
Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Pickands, Mather & Co., Union Commerce Bldg., Cleveland, O.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

IRON (Powder)
Ekstrand & Tholand, Inc., 411 Lexington Ave. New York City.

JIGS AND FIXTURES
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KETTLES (Galvanizing)
Petroleum Iron Works Co., Sharon, Pa

KEYS (Machine)
Leard, Wm., Co., Inc., New Brighton, Pa
Moltrup Steel Products Co., Beaver Falls, Pa.

KEYS (Woodruff)
Leard, Wm., Co., Inc., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

KEYSEATERS
Davis Keyseater Co., 399 Exchange St., Rochester, N. Y.

KILNS
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.

KNIVES (Rotary)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

KNIVES (Shear, Solid Steel, Fiving)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.

LABORATORY WARE
Norton Company, Worcester, Mass.

LADLES
Petroleum Iron Works Co., Sharon, Pa.

LAMPS (Filaments)
General Electric Co., Nela Park, Cleveland, O.
Westinghouse Electric & Mfg. Co., 150 Broadway, New York City.

LAMPS (Mercury Vapor)
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

LAMPS (Neon Glow)
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

LAPPING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

LATHES (Automatic)
Jones & Lamson Machine Co., Springfield, Vt.

LATHES (Roll Turning)
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret)
Bullard Company, The, Bridgeport, Conn.
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret) (Automatic Vertical)
Bullard Company, The, Bridgeport, Conn.

LEAD (Chemical, Corroding, Desilvered)
St. Joseph Lead Co., 250 Park Ave., New York City.

LEAD (Tellurium)
National Lead Co., 111 Broadway, New York City.

LETTERHEADS (Engraved)
Modern Card Co., 1153 Fullerton Ave., Chicago, Ill.

LEVELING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIGHT OIL RECOVERY & TREATMENT EQUIPMENT
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LOCK WASHERS
Shakeproof Lock Washer Co., 2501 N. Keeler Ave., Chicago, Ill.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Cooper-Bessemer Corp., Mt. Vernon, O.
Plymouth Locomotive Works, Plymouth, O.

LOCOMOTIVES (Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.

LOCOMOTIVES (Gas-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.

LOCOMOTIVES (Switching and Transfer)
Cooper-Bessemer Corp., Mt. Vernon, O.

WHERE-TO-BUY

LUBRICANTS (Industrial)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Union Oil Corp., 50 W. 50th St., New York City.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

LUBRICATING SYSTEMS
Farval Corp., 3270 E. 80th St., Cleveland, O.

MACHINE WORK
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.

MACHINERY (Shearing, Hand)
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

MACHINERY (Second Hand)
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.

MACHINERY (Special)
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., The, Milwaukee, Wis.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co. First National Bank Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)
Norton Co., Worcester, Mass.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

MAGNETS (Separating)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

MANGANESE METAL AND ALLOYS
American Manganese Steel Co., Chicago Heights, Ill.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

MANGANESE ORE
Amtorg Trading Corp., Sojuzugleexport Div., 261 Fifth Ave., New York City.
Samuel, Frank, Co., Inc., Harrison Bldg., Philadelphia, Pa.

MANIPULATORS
Alliance Machine Co., The, Alliance, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind
Morgan Engineering Co., The, Alliance, O.

MARKERS (Industrial)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

MARKING DEVICES
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)
Pittsburgh Crushed Steel Co., 61st St. and A. V. R. R., Pittsburgh, Pa.

METAL CLEANERS
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Nonferrous)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

MILLING MACHINES (Milling and Centering Combined)
Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM
Climax Molybdenum Co., 500 Fifth Ave., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

MONEL METAL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

MORTAR (Molding)
Faulkner Refractories Co., J. A., Mahoning Bank Bldg., Youngstown, O.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Crocker-Wheeler Electric Mfg. Co., Ampere, N. J.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-1.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MUCK BAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

NAILS (*Also Stainless)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.

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NAILS—Con.
Keystone Steel & Wire Co., Peoria, Ill.
*Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)
Wickwire Brothers, 189 Main St., Cortland, N. Y.

NICKEL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL-CHROMIUM (Shot)
Driver-Harris Co., Harrison, N. J.

NICKEL STEEL (Cold Drawn)
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST, Cleveland, O.
Union Drawn Steel Co., Massillon, O.

NITROGEN COMPOUNDS
American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York City.

NOZZLES (Descaling)
Aldrich Pump Co., The, Allentown, Pa.

NUTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap & Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave., at W. 12th St., Erie, Pa.
Oliver Iron & Steel Corp., S. 10th and Muriel Sts., Pittsburgh, Pa.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Tinnerman Stove & Range Co., 2039 Fulton Rd., Cleveland, O.
Triplex Screw Co., The, 5319 Grant St., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Cold Punched)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
Oliver Iron & Steel Corp., So. 10th and Muriel Sts., Pittsburgh, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Hot Pressed)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
Oliver Iron & Steel Corp., So. 10th and Muriel Sts., Pittsburgh, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Semi-Finished)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.
Oliver Iron & Steel Corp., So. 10th and Muriel Sts., Pittsburgh, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

OILS (Cutting)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Union Oil Corp., 50 W. 50th St., New York City.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Rust Preventive)
American Chemical Paint Co., Ambler, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Maehler Co., Paul, 2210 W. Lake St., Chicago, Ill.
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.

OVENS (Conveyor or Truck Type)
Ross, J. O., Engineering Co., 350 Madison Ave., New York City.

OVENS (Core and Mold)
Holcroft & Co., 6545 Epworth Blvd., Detroit, Mich.
Maehler Co., Paul, 2210 W. Lake St., Chicago, Ill.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

PACKING (Asbestos or Rubber)
Goodrich, B. F., Co., The, Akron, O.
Johns-Manville Corp., 22 E. 40th St., New York City.
U. S. Rubber Products, Inc., 1790 Broadway, New York City.

PAINT (Alkali Resisting)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.

PAINT (Aluminum)
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.

PAINT (Heat Resisting)
American Chemical Paint Co., Ambler, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.

PAINT (Industrial)
Quigley Company, Inc., 56 W. 45th St., New York City.

PAINT (Marking)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

PAINT (Pretreatment)
American Chemical Paint Co., Ambler, Pa.

PAINT (Rust Preventive)
American Chemical Paint Co., Ambler, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

PAINT (Stick Form)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

PAINTING (Industrial)
Blakley, Dilworth & Co., Rock Hall, Md.

PERFORATED METAL
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

PHENOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

PIERCER POINTS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PICKLING COMPOUND
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

PICKLING EQUIPMENT
International Nickel Co., Inc., The, 67 Wall St., New York City.

PICKLING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS
Ceilcote Co., The, Rockefeller Bldg., Cleveland, O.
Keagler Brick Co., 443 W. Market St., Steubenville, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa

PICKLING TANKS—See TANKS (Pickling)

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pickands, Mather & Co., Union Commerce Bldg., Cleveland, O.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.

PILING (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Co., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Ball)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.

PILLOW BLOCKS (Roller Bearing)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

PILLOW BOXES
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINIONS (Mill)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Case Hardened or Heat Treated)
Erie Bolt & Nut Co., Liberty Ave., at W. 12th St., Erie, Pa.

PINS (Taper)
Leard, Wm., Co., Inc., New Brighton, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Shenango-Penn Mold Co., Dover, O.

PIPE (New and Used)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

PIPE (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE BALLS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.

PIPE CUTTING AND THREADING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE ELIMINATORS
Alpha-Lux Co., Inc., 192 Front St., New York City.

PIPE FITTINGS
Babcock & Wilcox Co., 19 Rector St., New York City.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machy. Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.

PIPE MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Yoder Co., The, 5500 Walworth Ave., Cleveland, O.

PIPE STRAIGHTENING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.

PIPING CONTRACTORS
Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.

PIPING (Air and Gas)
Youngstown Steel Tank Co., The, Oak St. & Andrews Ave., Youngstown, O.

PISTON RINGS
American Hammered Piston Ring Div., The Koppers Co., Baltimore, Md.

PISTON RODS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Leard, Wm., Co., Inc., New Brighton, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Burnham, Pa.
Union Drawn Steel Co., Massillon, O.

PLANERS AND SHAPERS
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

PLATE CASTORS
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

PLATES (Sheared or Universal) (*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., Middletown, O.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2507 E. Cumberland St., Philadelphia, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
*Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)
Granite City Steel Co., Granite City, Ill.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLUGS (Mold)
McLain Fire Brick Co., Gulf Bldg., Pittsburgh, Pa.

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PLUGS (Rubber)
Rhoades, R. W., Metaline Co., 50 Third St., Long Island City, N. Y.

POLE LINE HARDWARE
Oliver Iron & Steel Corp., S. 10th and Muriel Sts., Pittsburgh, Pa.

POLES (Tubular Steel)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

POLISHING MACHINERY (Tube and Bar)
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.

POLISHING MACHINES, AUTOMATIC (Stainless Steel)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

POTS (Case Hardening)
Pressed Steel Tank Co., Milwaukee, Wis.

POTS (Melting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

PRECIPITATORS (Cottrell Electric)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

PREHEATERS
Babcock & Wilcox Co., 19 Rector St., New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Zeh & Hahnemann Co., Ave. "A" and Vanderpool St., Newark, N. J.

PRESSES (Bending)
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

PRESSES (Forging)
Erie Foundry Co., Erie, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

PRESSES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., The Mt. Gilead, O.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
West Tire Setter Co., 399 Exchange St., Rochester, N. Y.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.

PRESSES (Riveting)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Welding)—See WELDERS

PRESSURE VESSELS
Babcock & Wilcox Co., 19 Rector St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

PULLEYS (Magnetic)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

PULVERIZERS
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.

PUMPS (Boiler Feed)
Aldrich Pump Co., The, Allentown, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Centrifugal)
Aldrich Pump Co., The, Allentown, Pa.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Hydraulic)
Aldrich Pump Co., The, Allentown, Pa.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Rotary)
Roper, Geo. D., Corp., Rockford, Ill.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.

PUMPS (Vacuum)
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
Chambersburg Engineering Co., Chambersburg, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PYROMETER TUBES
Driver-Harris Co., Harrison, N. J.
Norton Company, Worcester, Mass.

PYROMETERS
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

RAIL BREAKERS
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

RAILS (New and Relaying)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Hyman-Michaels Co., 122 S. Michigan Ave., Chicago, Ill.

RAILS (Light and Accessories)
Buckeye Rolling Mill Co., Wheeling, W. Va.

RAILS (Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Buckeye Rolling Mill Co., Wheeling, W. Va.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

REAMERS
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Blanchard Machine Co., The, 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

REAMERS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REAMERS (Sand, Ingot Mold—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REBUILT EQUIPMENT
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa

RECEIVERS
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.

RECORDERS (Pressure, Speed, Temperature, Time)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

REDUCERS (Speed)—See SPEED REDUCERS

REDUCTION GEARS
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.

REFRACTORIES (Dolomite)
Basic Dolomite, Inc., Hanna Bldg., Cleveland, O.

REFRACTORIES (Fire Clay)
Babcock & Wilcox Co., 19 Rector St., New York City.
Climax Fire Brick Co., Climax, (Clarion Co.) Pa.
Eureka Fire Brick Co., 1100 B. F Jones Law Bldg., Pittsburgh, Pa.
Faulkner Refractories Co., J. A. Mahoning Bank Bldg., Youngstown, O.
Keagler Brick Co., 443 W. Market St., Steubenville, O.
McLain Fire Brick Co., Gulf Bldg., Pittsburgh, Pa.
Quigley Company, Inc., 56 W. 45th St., New York City.
West Virginia Fire Clay Mfg. Co., Diamond BK Bldg., Pittsburgh, Pa.

REFRACTORIES (High Temperature)
Alpha-Lux Co., Inc., 192 Front St., New York City.
Quigley Company, Inc., 56 W. 45th St., New York City.

REFRACTORIES (Silica)
Alpha-Lux Co., Inc., 192 Front St., New York City.

REFRACTORIES (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

REGULATORS (Temperature)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1326 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

RINGS (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Burnham, Pa.
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

RINGS (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

RINGS (Weldless) (*Also Stainless)
*Midvale Co., The, Nicetown, Philadelphia, Pa.

RIVER TRANSPORTATION
Campbell Transportation Co., Granite Bldg., Pittsburgh, Pa.

RIVETERS (Hydraulic—Portable and Stationary)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETERS (Jam, Pedestal, Staybolt, Squeeze, Stationary, Yoke—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

RIVETERS (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETING MACHINERY
Chambersburg Engineering Co., Chambersburg, Pa.
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., 611 N. Mechanic St., Jackson, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

RIVETS (*Also Stainless)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Oliver Iron & Steel Co., S. 10th and Muriel Sts., Pittsburgh, Pa
Progressive Mfg. Co., Torrington, Conn.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, Pa.
Triplex Screw Co., The, 5319 Grant St., Cleveland, O.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

RODS (Drill)
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Kidd Drawn Steel Co., Aliquippa, Pa.

RODS (Rounds, Flats and Shapes) (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
*Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. St., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., Youngstown, O.

RODS (Steel and Iron)
Firth-Sterling Steel Co., McKeesport, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

ROLL COOLERS (Internal, Water)
Hunt, C. B., & Son, Salem, O.

ROLLING DOORS & SHUTTERS —See DOORS & SHUTTERS

ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)

ROLLING MILL EQUIPMENT
Aetna-Standard Engineering Co., The, Youngstown, O.
Alliance Machine Co., The, Alliance, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
Streine Tool & Mfg. Co., New Bremen, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Yoder Co., The, 5500 Walworth Ave., Cleveland, O.

ROLLS (Magnetic)
Stearns Magnetic Mfg. Co., The, 650 So. 28th St., Milwaukee, Wis.

ROLLS (Sand and Chilled)
Aetna-Standard Engineering Co., The, Youngstown, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Steel and Iron)
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1124, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROOFING AND SIDING (Corrugated and Plain)
American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

ROOFING (Plastic and Liquid)
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)
Goodrich, B. F., Co., The, Akron, O.
Rhoades, R. W., Metaline Co., 50 3rd St., Long Island City, N. Y.
U. S. Rubber Products, Inc., 1790 Broadway, New York City.

RUBBER PLUGS—See PLUGS

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

RUST PROOFING PROCESS
American Chemical Paint Co., Ambler, Pa.
Enterprise Galvanizing Co., 2507 E. Cumberland St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

SALT TABLETS
Morton Salt Co., 208 W. Washington St., Chicago, Ill.

SAND (Annealing Box Sealing)
Industrial Silica Corp., Stambaugh Bldg., Youngstown, O.

SAND (Molding)
Industrial Silica Corp., Stambaugh Bldg., Youngstown, O.

SAND (Silica)
Industrial Silica Corp., Stambaugh Bldg., Youngstown, O.

SAND (Slag Pocket)
Industrial Silica Corp., Stambaugh Bldg., Youngstown, O.

SAND AND METALLIC BLAST EQUIPMENT
American Foundry Equipment Co., Mishawaka, Ind.

SANDBLAST ABRASIVES (Sand)
Industrial Silica Corp., Stambaugh Bldg., Youngstown, O.

SAND CONDITIONING AND PREPARING MACHINERY
American Foundry Equipment Co., Mishawaka, Ind.
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.

SAWING MACHINES (Contour)
Continental Machine Specialties, Inc., 1301 Washington Ave. So., Minneapolis, Minn.

SAWS (Hot and Cold)
Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SAWS (Metal Cutting)
Youngstown Sheet & Tube Co., Youngstown, O.

SCALES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Dial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Monorail)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Kron Co., The, Bridgeport, Conn.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.

SCALING TOOLS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

SCRAP (Iron and Steel)
Hyman-Michaels Co., 122 S. Michigan Ave., Chicago, Ill.

SCRAP BALING PRESSES—See BALING PRESSES

SCREENS AND SIEVES
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.
Chicago Perforating Co., 2443 W. 24th Pl. Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

SCREW EXTRACTORS
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
Progressive Mfg. Co., Torrington, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

WHERE-TO-BUY

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

SCREWS
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Progressive Mfg. Co., Torrington, Conn.

SCREWS (Cap, Set, Safety-Set)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Standard Pressed Steel Co., Stewart Ave., & Kenmire St., Jenkintown, Pa.
Triplex Screw Co., The, 5319 Grant St., Cleveland, O.

SCREWS (Cold Headed)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Machine)
Progressive Mfg. Co., Torrington, Conn.
Triplex Screw Co., The, 5319 Grant St., Cleveland, O.

SCREWS (Socket, Head, Cap)
Standard Pressed Steel Co., Stewart Ave., & Kenmire St., Jenkintown, Pa.

SEAMLESS STEEL TUBING—See TUBES

SEPARATORS (Magnetic)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

SEPARATORS (Sand)
Dings Magnetic Separator Co., 675 Smith St., Milwaukee, Wis.
Stearns Magnetic Mfg. Co., 650 So. 28th St., Milwaukee, Wis.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING
Bliss & Laughlin, Inc., Harvey, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Steel Works Co., Burnham, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHAPERS
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.

SHAPES (Brass, Bronze, Nickel Silver)
Titan Metal Mfg. Co., Bellefonte, Pa.

SHAPES (Steel)—See STEEL (Structural)

SHAPES, SPECIAL (Steel)
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHEAR BLADES
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Wapakoneta Machine Co., Wapakoneta, O.

SHEARS
Aetna-Standard Engineering Co., The, Youngstown, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SHEARS (Metal Band)
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

SHEARS, ROTARY (Slitting, Beveling, Circling, Flanging)
Yoder Co., The, 5500 Walworth Ave., Cleveland, O.

SHEET BARS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEET CARRIERS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J. B. Engineering Sales Co., New Haven, Conn.

SHEET METAL PRODUCTS—See STAMPINGS

SHEET METAL WORKERS MACHINES
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.
Niagara Machine & Tool Works 637 Northland Ave., Buffalo, N. Y.
Streine Tool & Mfg. Co., New Bremen, O.
Yoder Co., The, 5500 Walworth Ave., Cleveland, O.

SHEET STEEL PILING (New and Used)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

SHEETS (Acid Resisting)
International Nickel Co., Inc., The 67 Wall St., New York City.

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SHEETS (Black)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)

American Brass Co., The, 25 Broadway, New York City.
Ampco Metal, Inc., 3831 W. Burnham St., Milwaukee, Wis.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)

American Rolling Mill Co., The, Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Deep Drawing and Stamping)

Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Electrical)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Galvanized)

American Rolling Mill Co., The, Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS (Hot Rolled and Hot Rolled Annealed)

Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Long Terne)

Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Perforated)

Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Reinforced)

Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)

Granite City Steel Co., Granite City, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SIEVES—See SCREENS AND SIEVES

SILICO-MANGANESE

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SILICON METAL AND ALLOYS

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

SKELP (Steel)

Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)

Brosius, Edgar E., Inc., Sharpsburg, Pa.

SMALL TOOLS

Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.

SOAKING PITS

Amsler-Morton Co., Fulton Bldg., Pittsburgh, Pa.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

SOLVENT (Degreasing)

Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SPACING TABLES

Thomas Machine Mfg. Co., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS

Cleveland Worm & Gear Co. 3249 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
New Departure Div., General Motors Corp., Bristol, Conn.

SPIEGELEISEN

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

SPINDLES

Leard, Wm., Co., Inc., New Brighton, Pa.

SPLICE BARS (Rail)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)

*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Standard Steel Works Co., Burnham, Pa.
Washburn Wire Co., Inc., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

SPRINGS (Alloy)

Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

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Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPROCKETS

Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

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Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.

STAMPINGS

American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
G G G Metal Stamping Co., Warren, Pa.
Grammes, L. F., & Sons, Inc., Allentown, Pa.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Lansing Stamping Co., Lansing, Mich.
Pressed Steel Tank Co., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.

WHERE-TO-BUY

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Toledo Stamping & Mfg. Co., 99 Fearing Blvd., Toledo, O.
Transue & Williams Steel Forging Co., Alliance, O.
Whitehead Stamping Co., 1661 W. Lafayette Blvd., Detroit, Mich.

STAPLES (Wire)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

STARTERS (Electric Motor)

Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

STEEL (Alloy)

Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Vanadium-Alloys Steel Co., Latrobe, Pa.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.

STEEL (Alloy, Cold Finished)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Carbon)

Uddeholm Co. of America, Inc., 155 E. 44th St., New York City.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)

Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
*Granite City Steel Co., Granite City, Ill.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Kidd Drawn Steel Co., Aliquippa, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Cold Finished)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Sharon Steel Corp., Sharon, Pa.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Steel & Tube Co., Canton, O.

STEEL (Die)

Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Milne, A., & Co., 745 Washington St., New York City.
Uddeholm Co. of America, Inc., 155 E. 44th St., New York City.
Vanadium-Alloys Steel Co., Latrobe, Pa.

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Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
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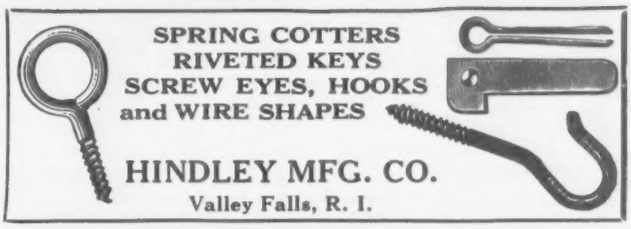

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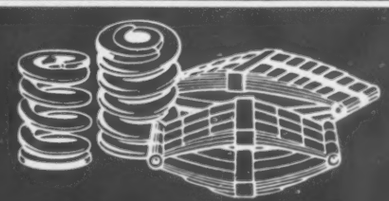

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Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Latrobe Electric Steel Co., Latrobe, Pa.
Milne, A., & Co., 745 Washington St., New York City.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL (High Tensile, Low Alloy)

Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Manganese)

American Manganese Steel Co., Chicago Heights, Ill.

STEEL (Nitriding)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Washburn Wire Co., Phillipsdale, R. I.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

STEEL (Strip, Copper Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., Warren, O.

STEEL (Strip, Hot and Cold Rolled) (*Also Stainless)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2507 E. Cumberland St., Philadelphia, Pa.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Sharon Steel Corp., Sharon, Pa.
*Stanley Works, The, New Britain, Conn, Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co. Brown Marx Bldg., Birmingham, Ala.
Thomas Steel Co., Warren, O.
Washburn Wire Co., Phillipsdale, R. I.
Weirton Steel Co., Weirton, W. Va
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.

STEEL (Strip, Tin Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., The, Warren, O

STEEL (Strip, Zinc Coated)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., Warren, O.

STEEL (Structural) (*Also Stainless)

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Enterprise Galvanizing Co., 2507 E. Cumberland St., Philadelphia, Pa.
Erie Steel Construction Co., Erie, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
*Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Levinson Steel Co., The, 39 Pride St., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 N. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)

Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Beals, McCarthy & Rogers, Inc., 40-62 Terrace, Buffalo, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Carpenter Steel Co., Reading, Pa.
Colonial Steel Co., Grant Bldg., Pittsburgh, Pa.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Kidd Drawn Steel Co., Aliquippa, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Milne, A., & Co., 745 Washington St., New York City.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Uddeholm Co. of America, Inc., 155 E. 44th St., New York City.
Vanadium-Alloys Steel Co., Latrobe, Pa.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS AND SHUTTERS —See DOORS AND SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS, ETC.

STEEL PLATE CONSTRUCTION

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Munroe, R., & Sons Mfg. Corp., 23rd St., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Youngstown Steel Tank Co., The, Oak St. & Andrews Ave., Youngstown, O.

STELLITE

Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STOKERS

Babcock & Wilcox Co., 19 Rector St., New York City.

STOPPERS (Cinder Notch)

Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa
Brosius, Edgar E., Inc., Sharpsburg, Pa.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY

Aetna-Standard Engineering Co., The, Youngstown, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3438 E. 76th St., Cleveland, O.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.

STUDS (Alloy, Carbon or Stainless)

Erie Bolt & Nut Co., Liberty Ave. at W. 12th St., Erie, Pa.

SULPHURIC ACID

American Cyanamid & Chemical Corp., 30 Rockefeller Plaza, New York City.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Pittsburgh, Pa.

SWITCHES (Electric)

Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
General Electric Vapor Lamp Co., 885 Adams St., Hoboken, N. J.

TACHOMETERS

Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

TANK LININGS

Ceilcote Co., The, Rockefeller Bldg., Cleveland, O.
Quigley Company, Inc., 56 W. 45th St., New York City.

TANKS (Pickling)

Goodrich, B. F., Co., The, Akron, O.
U. S. Rubber Products, Inc., 1790 Broadway, New York City.

TANKS (Quenching, Automatic)

American Gas Furnace Co., Elizabeth, N. J.

TANKS (Storage, Pressure, Riveted, Welded)

American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Youngstown Steel Tank Co., The, Oak St. & Andrews Ave., Youngstown, O.

TANKS—WOOD OR STEEL (Rubber or Lead Lined)

Goodrich, B. F., Co., The, Akron, O.
U. S. Rubber Products Inc., 1790 Broadway, New York City.

TANTALUM CARBIDE

Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit, Mich.

TAPS AND DIES

Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., Waynesboro, Pa.

TEMPERING

Holden, A. F., Co., New Haven, Conn.

TERNE PLATE—See TIN PLATE

TESTING MACHINES (Moisture Tester)

Alpha-Lux Co., Inc., 192 Front St., New York City.

THERMOMETERS

Brown Isntrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS

Landis Machine Co., Inc., Waynesboro, Pa.

WHERE-TO-BUY

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Washington Tin Plate Co., Washington, Pa.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TONGS (Rail Handling)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

TOOLS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

TOOLS (Precision, Lathe, Metal Cutting, etc.)
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit, Mich.
McKenna Metals Co., Steel Ave., Latrobe, Pa.

TOOLS (Tantalum Carbide)
Carboloy Co., Inc., 2985 E. Jefferson Ave., Detroit, Mich.

TOOLS (Tipped, Carbide)
McKenna Metals Co., Steel Ave., Latrobe, Pa.

TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

TORCHES AND BURNERS (Air—Gas)
American Gas Furnace Co., Elizabeth, N. J.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TRACK ACCESSORIES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Oliver Iron & Steel Corp., So. 10th & Muriel Sts., Pittsburgh, Pa.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TRAILERS (Arch-Girder)
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRAMRAILS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRANSFORMERS
Wagner Electric Corp., 4904 Baum Blvd., Pittsburgh, Pa.

TRANSMISSIONS (Variable Speed)
Reeves Pulley Co., Columbus, Ind.

TRAPS (Steam and Radiator)
Johns-Manville Corp., 22 E. 40th St., New York City.

TRAYS (Heat Treating)
Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.

TREADS (Safety)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp., Machinery Div., Dravo Bldg., Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Dravo Bldg., Pittsburgh, Pa.

TROLLEYS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Northern Engineering Works, 2615 Atwater St., Detroit, Mich.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Electric Industrial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Automatic Transportation Co., 101 W. 87th St., Chicago, Ill.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Industrial)
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.

TRUCKS (Lift)
Automatic Transportation Co., 101 W. 87th St., Chicago, Ill.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.

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Aetna-Standard Engineering Co., The, Youngstown, O.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

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✓ STONE	✓ BALE TIES
✓ STAPLE	✓ BOOKBINDING
✓ TAG	✓ AND OTHERS

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TUBES (Boiler)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., 19 Rector St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 15020 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Youngstown Sheet & Tube Co., Youngstown, O.

TUBES (Brass, Bronze, Copper)
Bridgeport Brass Co., Bridgeport, Conn.

TUBING (Alloy Steel) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Timken Steel & Tube Co., Canton, O.

TUBING (Cold Drawn Seamless Steel)
Columbia Steel Co., San Francisco, Calif.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 15020 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.

TUBING (Copper, Brass, Aluminum)
Shenango-Penn Mold Co., Dover, O.

TUBING (Welded Steel)
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Tube Co., The, 15020 Woodward Ave., Detroit, Mich.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUMBLING BARRELS (Coke Testing)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

TUNGSTEN CARBIDE
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bissett Steel Co., The, 900 E. 67th St., Cleveland, O.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

TUNGSTEN CARBIDE (Tools and Dies)
Carboloy Co., Inc., 2985 Jefferson Ave., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.

TUNGSTEN METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TURBINES (Steam)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TUYERES
Climax Fire Brick Co., Climax, (Clarion Co.) Pa.

TWIST DRILLS
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

VALVES (Blast Furnace)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

VALVES (Control—Air and Hydraulic)
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

VALVES (Electrically Operated)
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

VALVES (Gas and Air Reversing)
Blaw-Knox Co., Blawnox, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

VALVES (Gate)
American Chain & Cable Co., Bridgeport, Conn.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

VALVES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Vickers, Inc., 1400 Oakman Blvd., Detroit, Mich.
Wood, R. D., 400 Chestnut St., Philadelphia, Pa.

VALVES (Hydraulic De-Scaling)
Hunt, C. B., & Son, Salem, O.

VALVES (Steam and Water)
American Chain & Cable Co., Bridgeport, Conn.
Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburgh, Pa.

VALVES AND FITTINGS—See PIPE FITTINGS

VANADIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

VIADUCTS (Steel)—See BRIDGES, ETC.

WALKWAYS—See FLOORING—STEEL

WASHERS (Gas)
McKee, Arthur G. & Co., 2422 Euclid Ave., Cleveland, O.

WASHERS (Iron and Steel)
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Peoria Malleable Castings Co., Peoria, Ill.

WELDERS (Electric—Arc, Spot, Seam, Flash, Butt, Automatic Projection, Hydromatic, Etc.)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-1.
Thompson-Gibb Electric Welding Co., Lynn, Mass.

WELDING
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-1.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Electric)
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-1.
Thompson-Gibb Electric Welding Co., Lynn, Mass.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING AND CUTTING APPARATUS AND SUPPLIES (Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.

WELDING RODS (Alloys)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-1.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.

WELDING RODS (Bronze)
Titan Metal Mfg. Co., Bellefonte, Pa.

WELDING RODS OR WIRE
Air Reduction Sales Co., 60 East 42nd St., New York City.
American Brass Co., The, 25 Broadway, New York City.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bridgeport Brass Co., Bridgeport, Conn.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-1.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
Page Steel & Wire Co., Monessen, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Roebling's John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., Phillipsdale, R. I.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Wilson Welder & Metals Co., 60 East 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WHEELS (Car and Locomotive)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Standard Steel Works Co., Burnham, Pa.

WHEELS (Track)
National-Erie Corp., Erie, Pa.

WINCHES (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

WIRE (Alloy Steel) (*Also Stainless)
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Page Steel & Wire Co., Monessen, Pa.
*Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's John A., Sons Co., Trenton, N. J.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

WIRE (Annealed, Bright, Galvanized)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Page Steel & Wire Co., Monessen, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

WIRE (Barb)
Bethlehem Steel Co., Bethlehem, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE (Brass)
Titan Metal Mfg. Co., Bellefonte, Pa.

WIRE (Cold Drawn)
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.

WIRE (Heat Resisting)
Driver-Harris Co., Harrison, N. J.

WIRE (High Carbon)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., Inc., 118th St. and Harlem River, New York City.

WIRE (Music)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.

WHERE-TO-BUY

WIRE (Music)—Con.

Washburn Wire Co., Inc., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

WIRE (Round, Flat, Square, Special Shapes)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., Los Angeles, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee, Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Washburn Wire Co., Inc., 118th St. and Harlem River, New York City.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE (Spring)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

WIRE (Stainless)

Firth-Sterling Steel Co., McKeesport, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.

WIRE (Threaded)

Progressive Mfg. Co., Torrington, Conn.

WIRE (Welding)—See WELDING RODS OR WIRE

WIRE AND CABLE (Electric)

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Anaconda Wire & Cable Co., 25 Broadway, New York City.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE BUGGIES

Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

WIRE CLOTH

Cambridge Wire Cloth Co., The, 101 Washington St., Cambridge, Md.
Cyclone Fence Co., Waukegan, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

WIRE FORMS, SHAPES AND SPECIALTIES

American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Roebling's, John A., Sons Co., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, O.
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

WIRE MILL EQUIPMENT

Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3438 E. 76th St., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE NAILS—See NAILS

WIRE PRODUCTS (*Also Stainless)

*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
*Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Lacledę Steel Co., Arcade Bldg., St. Louis, Mo.
Leschen, A., & Sons Rope Co., 5909 Kennerly Ave., St. Louis, Mo.
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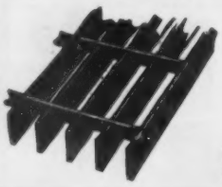

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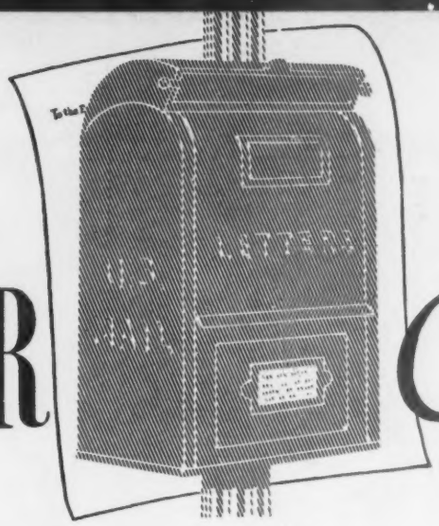

Readers are invited to comment upon articles, editorials, reports, prices or other editorial material appearing in STEEL. The editors cannot publish unsigned communications, but at their discretion may permit a writer to use a pseudonym when a bona fide reason exists for withholding his identity. Letters should be brief—preferably not exceeding 250 words.

Puts Burden on Buyer

To the Editor:

I have read with a great deal of interest Mirrors of Motordom in the Dec. 26 issue of STEEL, regarding a proposal to stabilize employment in the automotive industry. Why not carry this proposal one step further and dump into the lap of the buying public the responsibility for stabilizing employment in this particular industry, where, after all, it rightfully belongs?

At present, the dealer's price on an automobile is the same on the initial car delivered to him as on the final car taken off his floor during the current model run. It has always been a mystery to me how a dealer could ever hope to receive the same price on the last car off his floor as he does for the first car delivered to him.

True, he must make other concessions in the deal such as higher allowance for trade-in. As I understand it, dealers discount the trade-in value of a used car month by month. If this is true in the used car market, why shouldn't the same system be applicable on new cars?

In other words, assume an automobile sells for $900 delivered; this car then could be sold for $950 during the first month of the model year, presuming this to be September or October, and then would be reduced in price $10 per month until the final price on this same model during the last month of the season would be $830. This would penalize buyers who could afford to buy the initial production cars, and compensate those less fortunate.

It seems to me this would help stabilize employment and to place the responsibility where it belongs.

LEWIS C. SMITH

Atwood Vacuum Machine Co.,
Rockford, Ill.

Thou Shalt not Chisel

To the Editor:

A chisel's a small harmless tool,
Very seldom used for a murder.
But when one cheats, cut prices, chisels—
He's a,—hell, let's say nothing further.

A chisel used by a Mason,
With his knowledge of building and art,
Shapes stones for the very foundations
Of which things constructive's a part.

A chisel used by a Gouger
Can create the most hideous thing.
Such Chiseler at heart you'd damn, but
Is your office door open to him?

You can pay the Chiseler his price,
But remember you start a decline
That can go so far below cost
You can't find decent words to define.

How much better all things would be
Had we a floor and ceiling as guide—
Not too high, not too low, listen:
Just policed so the Chiseler can't hide.

You'd "Sell your goods at the market",
The Chiseler would be out on his back.
You'd "Buy your goods at the market"
And the Gouger'd find nothing to hack.

Decent wages, hours, conditions
Could at once be upheld without fear;
Investment, expansion, profits—
We'd all be in black ink for the year.

* * * * *

So why encourage the Chiseler
To chisel and the Gouger to hack?
Show them right out of your office;
Better throw them right out on their back.

* * * * *

We hate the Chiseler that chisels
Boy,—how we hate the Gougers that hack!
Pay a fair price for a product,
Then watch Business and Good Times come back.

Support the crowd that's constructive,
Throw away the chisel and fear.
Buy from the throng, not the Chiseler,
And we'll all have a Happy New Year.

H. D. NORTH

President,
Ferry Cap & Set Screw Co.,
Cleveland

Hobby Riding Is Valuable

To the Editor:

Encouraging pursuit of hobbies among its employes is an excellent move by any employer. A hobby serves to keep the mind alert and provides an interest outside the daily occupation, a rest and relaxation that relieves the mental fatigue resulting from concentration on business.

The example of the Warner & Swasey Co., related in STEEL, Dec. 26, is a case in point. The instant response by so large a number of employes indicates that probably twice as many will be represented next year. Sometimes a man rather shrinks from making public his hobby, in fear his fellows will laugh at him. Some men like to knit or do fancywork, or cook, and they are not sissies by any means.

I know a man who finds relaxation in a certain high-grade crossword puzzle from a foreign source and another who dabbles in chemistry, though his work is far removed from that science. Both profit from the change in outlook.

I have been asking a few questions around our plant and am quietly collecting data which may result in our imitating the Warner & Swasey show after a while. From present indications there will be some surprises in store for the entire personnel when we open the doors.

We will take advantage of the experience gained in the show you described and thus avoid some of the pioneering. When we are all set we will ask you to tell the world about our exhibit also.

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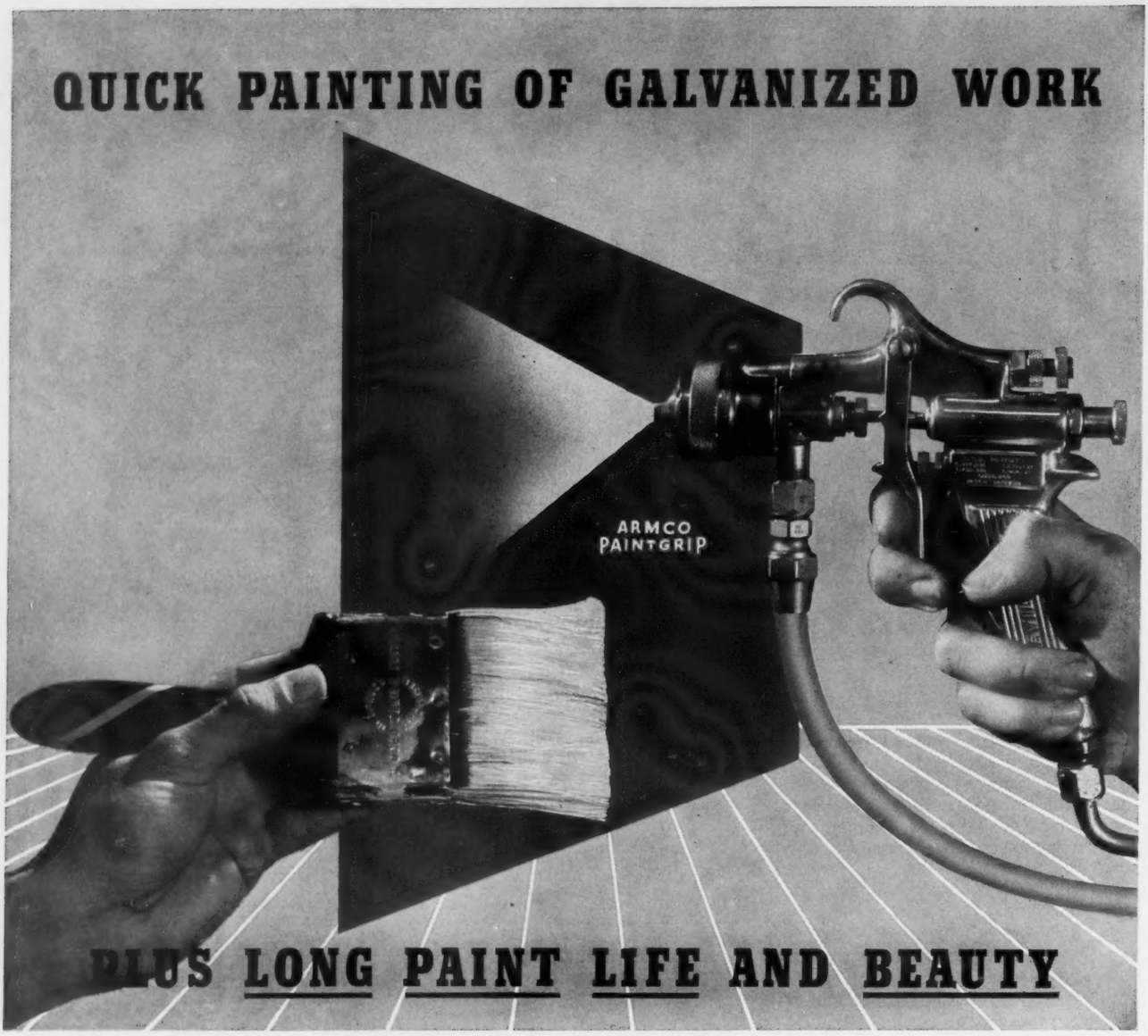

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